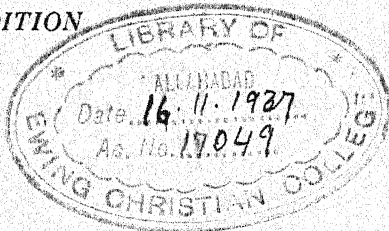


AN
ECONOMIC & COMMERCIAL
GEOGRAPHY OF INDIA

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Author of "Co-operation and Rural Welfare in India", etc.

THIRD EDITION



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PREFACE

THE study of the Geo-economics of India has been included in the course of studies in Geography, Economics and Commerce in all the important Indian Universities. There is hardly any book which deals with the subject principally from the Indian point of view. This book does not lay any claim to originality but efforts have been made to make it really useful to students and teachers. In preparing this book we have laid under contribution all important Government publications and the works of leading Indian Economists. A bibliography has been included at the end for the more ambitious students.

The author acknowledges with gratitude the encouragement he has received from Principal T. C. Orgill, M.A., I.E.S., F.R.G.S., Professor H. L. Kaji, M.A., I.E.S., K.I.H., Professor of Geography, Sydenham College of Commerce, Bombay, Dr. P. N. Banerjee, M.A., D.Sc., Minto Professor of Economics, Calcutta University and Rai Sahib J. N. Ghosh, M.A., Professor, Patna Training College.

Sabour.

B. B. MUKHERJEE,

PREFACE TO THE THIRD EDITION

The book has been thoroughly revised and enlarged in this edition. Some information about the economic conditions of the new Provinces of Sind and Orissa has also been incorporated in it. The author acknowledges with gratitude the assistance he has received from Prof. S. C. Chatterjee, M.Sc., Head of the Department of Geography, Patna College and Prof. S. N. Chatterjee of the Patna Science College,

Patna College.

B. B. MUKHERJEE,

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CHAPTER I.

THE PHYSICAL BACKGROUND.

NOWHERE else in the world has the physical environment exerted such a decisive influence in fashioning the destiny of a country, as in India. For ages she has been pre-eminently an agricultural country and her industries have been developed with a view to utilise and work up the products of her fields. The result has been that the whole outlook is decidedly agricultural. Three out of every four Indians, depend directly or indirectly on agriculture, and this industry has dwarfed all other industries in importance and size owing to the fact that the whole population depends upon it for sustenance, and the prosperity or otherwise of other industries is vitally connected with the success or failure of crops. Land is a stable fund of wealth and the possession of it gives to the owner distinction in society. It is even now considered to be the safest investment and a fairly large percentage of Indian capital yet looks to land for investment.

The country is as large as the whole of Europe excluding Russia and its greatest length from North to South is about 2,000 miles, while from East to West it extends over about 2,500 miles. In this vast country one meets with every variety of climate, of soil and natural conditions. The snow-capped Himalayan range forms a charming background to the level plains through which the Ganges and Indus roll majestically to the sea. The arid deserts of Rajputana stretching over miles and miles of a practically rainless tract afford a striking contrast to the hill slopes of Assam where, in the midst of heavy rainfall, the industrious cultivator has to work in his field.

India, as we have already stated, is a land of varieties, hence it is not possible to offer any general statement with

reference to any of her problems, but in the midst of this variety, her agriculture has emerged as the one common factor which is predominant even in the barren hill slopes of the North-west or of the North-east as well as in the more fortunately situated fertile river valleys in Northern India as well as in the Deccan. The agricultural development of these areas has been to a very large extent conditioned by a number of physical and climatological factors. The alluvial plains of Bengal enjoying a copious rainfall and immense irrigational facilities are admirably suitable for the growing of a number of crops, chief among which are rice and jute. Baluchistan, on the other hand, offers no encouragement to the cultivator and agriculture in this region is impeded by a number of physical disabilities. The soil is a loess deposit and on the hill slopes the sub-soil has layers of gravel and pebbles. The annual rainfall, in Quetta is below 9 inches, and it occurs between December and May. The principal means of irrigation is the karez,—“an underground tunnel on sloping land which collects the subterranean water in the fantaluses near the hills and discharges it on the surface.” The summer is hot and in winter the temperature goes down as low as 21° F. This wide variation in the temperature along with the lack of humidity in the air combined with the hot dry west winds makes fruit growing difficult and reduces the period of growth. Frosts sometimes appear even in May and destroy early flowering fruit crops such as almonds and apricots. The most formidable problems in this region are the economy of the water supply by improved methods of irrigation and the improvement in the texture of the soil by the growing of leguminous fodder crops like Persian clover and Lucerne.

The net total area of British India is 1,805,456 square miles excluding Aden and the Andamans and 13 per cent. of this area is covered with forests and 23 per cent. is not available for cultivation, thus leaving 64 per cent. of the area free for agriculture, but in 1926 only half of this area was actually under cultivation; thus there is ample scope for further extension of cultivation in India.

Four factors have contributed mainly to the prominence of agriculture in the Indian rural economy. (1) Rainfall is by far the most decisive factor in the agricultural life of India, hence Indian agriculture has very often been said to be "a gamble in the monsoon." The hard working cultivator looks up to the skies for the welcome rain-bearing cloud which alone is capable of rewarding his labour with bumper crops, and this has tended to develop in his mind an intense fatalism which is at times a great obstacle to enterprise. Rainfall exercises a great influence in determining the extent of cultivation and the nature of the crops while its influence on the methods of cultivation is no less important. India has two periods of rainfall, one in summer called the South-west monsoon and the north-east monsoon in winter.. During the summer of the northern hemisphere, north-western India becomes the seat of very low pressure on account of high temperature. The hot air expands and rises up and moves towards the south in the upper atmosphere and descends near the equatorial low pressure belt. After a time this low pressure trough is filled up and there is a counter-movement of wind from this region towards India.. At this time the south-east trade winds of the southern hemisphere also cross the equator and are deflected towards the south-west. The goal of these winds is, of course, the region of lowest pressure in north-west India but the actual distribution of rainfall is determined by the configuration of the country. These moisture laden winds are arrested by the high mountains in the western coast of India and in the eastern Himalayas, the moisture is condensed into rain and India gets a copious rainfall. The South-west monsoon gives heavy rain from June to October to the western coast strip of the Bombay Presidency, portions of Eastern Bengal, Eastern Himalayas, the coast strip of Burma including the Irrawady delta. The U. P., Bihar and Orissa, and Bengal proper get 40—75 inches of rain from June to October. The usual period of the winter monsoon is from December to February and the southern Madras

coast strip gets less than 10 inches, the Mysore and Hyderabad States and the Chittagong Division of Bengal receive more than 10 inches in November and December. The January rainfall is from 5 to 9 inches in the Punjab, the U. P. and Assam. Thus we find that the areas of the heaviest rainfall are in Bengal, Assam and the Bombay coast strip, while Bihar and Orissa, the C. P. and the Madras Presidency have over 50 inches and as we proceed westwards rainfall becomes scantier, Central Rajputana and Western Punjab receive about 10 inches while Sind and the N. W. F. Province do not get more than 8 inches of rain. Bengal and the desert of Rajputana are within the same latitudes but one is highly fertile and productive and due to its being situated far from the track of the rain-bearing winds the other is a barren desert. This distribution of rainfall is responsible for the distribution of vegetation, the area of cultivation starts from Eastern Punjab, and includes the U.P., Bihar and Bengal, while the eastern coast strip of Madras Presidency, portions of the C. P., Mysore, Hyderabad and the Bombay coast strip and Gujrat are well cultivated. The areas of low rainfall in Rajputana, portions of Sind, Central India and Southern India are scrub lands or are sparsely cultivated. These two monsoons determine the season of the two harvests of the year—the *kharif* is reaped in autumn, and the *rabi* is heaped in spring. The *kharif* crops require heat and copious rain, hence they are sown just after the South-east monsoon breaks and they are reaped in November and December. The *rabi* crops require a low temperature and they thrive without much irrigation. They are sown in October and are reaped in March. The *rabi* crop is important in the Punjab, the U. P. and Bihar while the *kharif* is the chief crop in areas which get a heavy rainfall. Humidity of the atmosphere and temperature play a very prominent part in fashioning the course of agriculture.

(2) Temperature.—The hot weather checks the growth of plant life, which flourishes again on the coming of the monsoon. Temperature acts directly on the plant in con-

trolling the rate of activity of the important process of assimilation and respiration; hence the selection of crops depends, to a large extent, on temperature. In Northern India, we notice great extremes of temperature, portions of the Punjab and the N. W. F. Province have a temperature over 90° in May while it is lower than 60° in February, and in some districts in this area, the range of temperature is even greater, temperature in summer rising above 100° and falling in winter to below freezing point. The coast strips have a more even temperature and the range of variation in temperature in Southern India is not very wide. May and June are the hottest months of the year and during these months the whole tract from the Punjab to the Hyderabad State including a portion of the U. P., Bihar, the Central Provinces, Rajputana and Central India have a temperature higher than 90° while the district round about Nagpur records an even higher temperature in August. When the temperature goes down with the coming of the monsoon in other parts of India, the N. W. F. Province and the Western Punjab record over 90° . Southern India has, therefore, a very short winter while the western part of Northern India has a fairly long winter. Wheat is grown in the Punjab, the U. P., the C. P. and Bihar, in areas which have a low temperature causing a fairly long winter and moderate rain. This Wheat Belt has its centre in the Punjab and the Agra Division of the U. P., places which have a pronounced winter, and where the rainfall during the rainy season (June to October) does not exceed 50 inches. In winter, the temperature in this area is about 60° with a rainfall below 2 inches. Rice requires a hot and moist climate, with a high summer temperature and a plentiful rainfall. The Rice Belt covers the whole of Bengal, eastern portion of Bihar, Orissa, the Madras coast strip (deltas of the Godavari, the Krishna, and the Kaveri), and the Western Konkan coast strip. This area gets a copious rainfall during the South-West Monsoon and the summer temperature is pretty high. Tea requires a damp and well drained soil, hence it is extensively grown in Assam, and on the Himalayan slopes

where the monsoon gives a copious rainfall and the water is drained off quickly. Kashmir with its low annual temperature due to its elevation enjoys almost a Mediterranean climate and its long spells of warm sunshine and bright, cloudless skies make it pre-eminently suitable for the growth of fruits like apples, peaches and grapes.

(3) Soil.—The plant is a fixture and it cannot move about to secure its food. The roots gather food during their downward course while the leaves and branches derive food from the atmosphere. Hence the development depends largely on the composition of the soil as well as on the meteorological conditions. The mineral properties in the soil determine the type of cultivation and the nature of crops grown. India has a wide variety of soil, the chief of which is alluvial. Soil of this type is the result of the action of rain, frost, wind and water which break up the rocks and deposit the particles elsewhere.. This soil is of a brown colour and it extends to a fairly good depth so that it ensures a sufficient fund of natural fertility and as it is mixed with clay, it can retain the rain water which percolates through it to a great depth. The presence of a large percentage of potash and lime with a moderate rainfall renders the cultivation of a variety of crops possible. Hence it is possible to grow two crops on this soil, one in winter and another in the autumn. It extends over almost the whole of Northern India owing to the fact that most of the great rivers take their rise in snow-covered mountains, the water supply is sufficient even in the summer months. The Indus and her tributaries pass through areas which are singularly deficient in rainfall, hence agriculture is confined only to the districts through which the rivers pass. Sind has a rainfall below 3 inches and the only means of irrigation for the scanty cultivation is by leading the water of the Indus to a few miles into the interior. The Ganges-Brahmaputra System covers a vast tract of land extending over the U. P., Bihar and Bengal and Assam, an area which contains fine alluvial soil and is blessed with a heavy rainfall. Intensive cultivation has been developed in this area and the pressure-

of the population on the soil is very great. The rivers of the Deccan take their rise in the Western Ghats or in the case of the Mahanadi, in the Central table land and flow into the Bay of Bengal after forming deltas at their mouths. Owing to the uneven nature of the country, these rivers are not of much use for agricultural purposes except in the plain stage, and there too the paucity of water during the hot weather, when most of these rivers dry up, make them practically useless.

(4) Irrigation.—The problem of irrigation is a very important one in India and this has been solved by the conservation of rain water and by leading the river water to the fields. Much rain water is now being carried to the sea and is being wasted. The Jumna, for example, has broken into its left banks and has rendered many thousands of acres of fertile land unfit for cultivation. In the districts on the left bank of the Ganges, the natural drainage of the country has been disturbed by the construction of railway embankments and floods and soil erosions are taking place every year to the detriment of agriculture. The rivers rising from the Vindhya or the Maikal Range like the Chambal and the Sone have to pass over hard rocky soil, hence when there is heavy rainfall in the Vindhyan slopes, very little water can soak through the soil and heavy floods are inevitable. These rivers are of little value for the purpose of irrigation and the broken country through which they pass do not permit the construction of canals. Cultivation, therefore, has not flourished too much alongside these rivers, as on the banks of the Himalayan tributaries of the Ganges, e.g., the Gumti, Gogra and the Gandak.

The irrigation problem of India resolves into the supply of water to places deficient in rainfall, with a view to ensure the crops against the failure of the monsoon. As an example of this, mention may be made of the Canal Colonies of the Punjab. Artificial irrigation in the Punjab is a necessity owing to its low rainfall, and the flatness of the country and the situation of the rivers is favourable to the cons-

truction of canals. . The five canal systems have converted arid deserts into flourishing granaries and "the area irrigated by the new canals is equal to the whole cultivated area of Egypt." The Canal Colony is the centre of Wheat cultivation of the Punjab and is the home of one of the sturdiest peasantry of India.

The Lloyd Barrage at Sukkur which was opened by His Excellency the Viceroy in January 1932 commands a gross area of $7\frac{1}{2}$ million acres of which $6\frac{1}{2}$ million acres are culturable. The Sutlej Valley Works consist of four weirs of which three are on the Sutlej with twelve canals taking off from above them. This project will irrigate 1,942,000 acres in British India, 2,825,000 acres in Bahawalpur State and 341,000 acres in Bikaner State.

In the Bombay Presidency at Lonavla the rainfall of the Western Ghats is being utilised for irrigation as well as for the generation of electric energy. These hydro-electric schemes have attained a large measure of success in Southern India, in Mysore as well as in Kashmir. Of the canals constructed for affording protection against famine, the most important are the Jumna and Ganges systems which have contributed to a large extent to the cultivation of sugar cane in the U. P.

AREA IRRIGATED IN 1930-31.

| Province. | Net area cropped. (Thousands acres.) | Area irrigated by Govt Irrigation Works (Thousands acres.) | Percentage of Area Irrigated to total cropped area. |
|-------------------|---|---|---|
| Madras | 39,193 | 7,573 | 19°5 |
| Bombay Deccan .. | 26,264 | 403 | 1°5 |
| Sind | 4,336 | 3,716 | 85°7 |
| Bengal | 28,399 | 73 | 0°3 |
| U.P. | 43,022 | 3,989 | 9°3 |
| Punjab | 30,265 | 11,485 | 38°0 |
| Burma | 18,023 | 2,098 | 11°6 |
| C.P. | 20,651 | 424 | 2°2 |
| Bihar & Orissa .. | 29,780 | 891 | 3°0 |
| N.W.F. | 2,423 | 405 | 16°7 |

The Sarda irrigation system in the United Provinces which was put into service in 1928 contains about 650 miles of main canals and branches, 3,600 miles of distributaries, and it will irrigate over 1,333,000 acres. In Southern India the construction of a large dam on the Cauvery at Mettur was completed in 1934. The reservoir has an effective capacity of 93,000 cubic feet. This system will improve the water supply of the existing system of irrigation extending over more than one million acres of the Cauvery Delta and irrigate a new area of 301,000 acres. The great lakes formed by the Bhandardara Dam and the Lloyd Dam at Bhatgar on the Western Ghats are feeding the Pravara and the Nira Canals respectively and as a result of this, this area which was once unproductive has now become an important centre of sugarcane cultivation.

Besides canals, Southern India has an extensive system of tank irrigation. These tanks are very deep and are excavated in the natural depression of the soil or are the result of dams put across hill slopes so as to collect and retain as much rain water as possible. In many places in Mysore and Hyderabad States a system of chain tanks exist in which a number of tanks at various levels are connected with one another and an extensive area is irrigated. The Madras Presidency abounds with large tanks and outside the Delta area, rice cultivation is restricted to the tank irrigated tract. Wells are more common in Northern India, where owing to the alluvial soil, water is found very close to the surface and well digging is an inexpensive affair. Various types of water lifts are employed, some of them are worked with bullock power.

Canal irrigation is remunerative only for the cultivation of the commercial crops, like cotton, sugarcane, wheat, tobacco and the garden crops. In fact sugarcane has followed the canal everywhere in India. In Southern India, however, rice is also partially irrigated with canal water and partly with tank water. In Sind, red rice is grown in the irrigated area.

In Northern India, well irrigation is at times likely to prove very risky when the wells are dried up as the result of long continued drought. The Agricultural Department has succeeded in solving this problem by joining the wells with the vast subterranean currents of water by means of narrow tubes, so as to ensure an inexhaustible water supply. The pump used to lift this water is the wheel from which pots hang and it is drawn by a pair of bullocks or by small oil engines.

By far the most important problem connected with irrigation in India is economy in the use of water. It is well known that any abuse of water is likely to destroy the natural fertility of the soil. "The soil particles, many of which are lenticular in shape arrange themselves parallel to the surface, and so reduce the total volume of the pore-space. This naturally diminishes percolation and reduces the air supply of the soil."* The best method is to use water moderately and give to the soil frequent dressings after irrigation. This improves the texture of the soil and increases its productivity. The waste of water which is being carried on is directly responsible for the reduction in yield of wheat from 759 lbs. per acre in 1908, to 372 lbs. per acre in 1913. The system of payment for water according to the area irrigated encourages this waste of water as the cultivator has no incentive to economise its use. Unless steps are immediately taken to alter this system or to teach the *ryot* the virtue of water economy, a time will come when the canal irrigated areas will become barren wastes and the capital spent in their construction will become a dead loss. The alkalisation of land is becoming a common occurrence in canal irrigated lands. In the Punjab and in the U. P. this alkali is found as a white or black deposit on the soil. Science has not yet been able to find out the causes of this occurrence or any method of combating it, but it has been observed that this deposit sucks up the moisture from the soil with the result that the plant dries up and in course of

* Howard—Indian Agriculture. Page 52.

time, the soil becomes incapable of producing any crops. Some attempts to reclaim land in the U. P. by washing out areas having slight deposits of alkali have succeeded, but it is too early to pronounce a final opinion and the further extension of canal irrigation depends to a large extent on the solution of this problem.

The method of cultivation varies in different provinces. Various factors have brought about a high percentage of the double cropped area in some provinces. In Bengal, U. P. and Bihar and Orissa it is as high as 16 per cent. while the percentage in Bombay is only 3 and in the Central Provinces is 7.5. Agricultural water supply and the nature of the soil promote the double cropping of land. Seasonable and copious rainfall in regions having an equal combination of clay and loam in the soil enables the land to be cultivated in winter immediately after the *kharif* harvest, as sufficient moisture is retained in the soil. In some Perganas of the Benares District of U. P. like Dhus and Majhwar more than one-third of the net cultivated area is twice cropped. The influence of the artificial canal irrigation in promoting double cropping is noticeable in Jaunpore and Cawnpore, where the percentage is 25.

CHAPTER II.

AGRICULTURE: MAIN FOOD CROPS.

In modern times, the development of Indian agriculture has been marked by an increasing degree of local specialisation in those crops which are liable to be exported.. . In the old economy, agriculture was carried on for the production mainly of food crops and every village grew most of its own food but with the gradual commercialisation of agriculture, the proportion of food crops to non-food crops is gradually declining in British India.

IN ACRES.

| Year. | | Net area sown. | Area under food grains. | Percentage |
|---------|----|----------------|-------------------------|------------|
| 1922 | .. | 224,945,489 | 205,027,338 | 91 |
| 1930 | .. | 229,115,200 | 202,736,000 | 88 |
| 1931-32 | .. | 228,835,924 | 205,013,960 | 89 |

The following table indicates the relative importance of the different food grains according to the area sown in 1930-31 :—

| |
|-----------------|
| Rice, 40 p.c. |
| Wheat, 12 p.c. |
| Jowar, 11 p.c. |
| Maize, 3 p.c. |
| Pulses, 15 p.c. |

Compared to oat and wheat, the food value of Rice is very low but it forms the staple food of India. Besides this the geographical conditions are also very well suited to the cultivation of rice. It grows in summer and requires a heavy rainfall during the growing period as the fields must remain flooded. Alluvial soil is very good for rice as it can conserve the moisture which is essential for its cultivation. The period of rainfall determines the period of growth. In some places as in Bengal, rice takes 120 to 150 days to grow,

while in Madras, a longer period is necessary. The geographical factors mentioned above render, Bengal, North Bihar, Madras coast strip, Bombay coast strip, Burma, Sind and Assam suitable for its cultivation. Rice is grown in all the seasons where conditions are favourable, but the winter rice, ripening in December and January, constitutes about 75 p.c. of the whole produce. In canal irrigated districts in Behar and Madras as many as three crops are raised on the same field annually.

India alone produces about 30 million tons of rice per year while Japan, Siam, Indo-China, Java and Korea taken together produce an equal amount, but the yield of rice per acre is very low when compared with that of other countries. In British India the average outturn per acre is $8\frac{1}{2}$ cwt., while Egypt produces 22 cwt. and Japan 21 cwt. per acre. The primitive method of cultivation in India is responsible for this low yield. The fields are scattered and plots are very small in size, hence the employment of machinery is not possible. The better varieties of seeds are at first sown in seed-beds and after the outbreak of the monsoon, they are transplanted in small bunches at distances of 6 to 12 inches apart. This method prevents waste but it is rather expensive and in many districts where there is a scarcity of labourers, the wages which have to be paid are very high and the cost of production goes up. In the case of inferior varieties, sowing is carried on broadcast. This method is no doubt wasteful but it is suitable for low-lying lands and as the sowing is usually finished before the outbreak of the rains, it sets the labour free for work on transplanted rice. The Department of Agriculture have after several experiments succeeded in finding out a heavy yielding variety of rice, which is likely to increase India's total output in course of time. In Bengal, *Indrasail* paddy produces 2,546 lbs. per acre, while another improved variety, the *Sadaisamba* produces 3,771 lbs. in Madras.

Husking and polishing are carried on in the villages by the time-old process of treading by bullocks and the women

are mainly employed in this industry. Machinery is, however, being gradually used for this work and in the various centres of rice production, rice milling industry is being developed. In these power-driven rice mills, the foreign matter is removed from the grain, then it is shelled, winnowed, the husk is separated, the grain is whitened and polished after which it is graded and bagged for export. Success in rice milling consists in obtaining the maximum proportion of whole, well cleaned white rice together with the automatic separation, grading and dressing of the broken rice. The Bengal centres of this industry are Calcutta, Burdwan, Hooghly, and Midnapur, while the important rice-growing districts are Barisal, Dinajpur, Mymensingh, Burdwan and Midnapur. In Madras, the chief rice-growing areas are Vizagapatam, Ganjam, Kistna, Tanjore, Godavari and Madura while the rice mills are located in the Godavari, Kistna and Tanjore Districts. Paddy is transported from the fields to the mills mainly by bullock-carts by road and boats by the river routes. Burma cultivates rice mainly for export, hence her rice milling industry is a very important one. She has started her rice mills in the neighbourhood of the ports of Rangoon and Akyab and she has now 350 rice mills out of 590 in India and Burma. Most of the mills are owned by Indians and Burmans but the Chinese merchants are also making a steady headway.

That the exports of Indian rice come from the surplus production is evidenced by the fact that in a year of bumper harvest as in 1904 or 1912 the exports went up to 2,500,000 tons and 2,750,000 tons, while in a year of scarcity as in 1919 they fell to 650,000 tons.

EXPORTS OF RICE.

| | |
|-------------------|-------|
| 1900—1,600,000 | tons. |
| 1904—2,500,000 | „ |
| 1908—1,500,000 | „ |
| 1912—2,750,000 | „ |
| 1919—650,000 | „ |
| 1925—2,600,000 | „ |
| 1931—2,372,000 | „ |
| 1933-34—1,744,000 | tons. |

In 1917 India had 38 per cent. of the world's rice trade. Half of the exported rice is consumed as food and the rest is utilised for the manufacture of spirits and alcohol. Her biggest customers are Ceylon (500,000 tons), Germany (400,000 tons), British Malaya (250,000 tons). The United Kingdom, Dutch East Indies, Japan and China have a large share of exports. Calcutta, Rangoon, Akyab and Madras are the main ports through which this large volume of exports pass.

WHEAT.

Next in importance to rice as an article of food is wheat. It is consumed mainly in the Punjab, the U. P., Bihar and Rajputana. The relatively higher nutritive value which wheat contains in comparison to rice probably accounts for the superior physique of the people of the Punjab and the U. P.

Wheat is principally a winter crop and thrives well when irrigated. Two factors principally determine the area of wheat production—temperature and rainfall or artificial irrigation. During the early period of its growth it requires a low temperature for sending up stalks from the buds near the root, and this limits the Wheat Belt in Northern India to the whole of the Punjab, N. W. F. Province and the U. P. which have a temperature below 75° in October—March, i.e., for 6 months. That accounts for the large acreage of wheat in the Punjab (9,079,000 acres) and the U. P. (7,899,000 acres) and the N. W. F. Province (1,014,240 acres). Wheat occupies 40 to 60 per cent. of the net area cropped in the districts of Multan, Montgomery, Lyallpur, Jhang, Mianwali, Shahpur, Gujranwala, Amritsar, Hoshiarpur, Gurdaspur, Sialkot, Gujrat and Jhelum in the Punjab, the districts of Bannu, Kohat and Peshawar in the N. W. F. Province and Saharanpur District in the United Provinces. In Bihar, where the winter is not so long as in the west, wheat is not so important, the actual acreage is 1,220,900 and usually an early ripening variety is grown. Wheat does

not flourish in a humid climate where the rainfall is above 30 inches per year but an occasional shower during its period of growth in January and February is very beneficial. In the Punjab, the annual rainfall does not exceed 30 inches and the winter rainfall is very favourable to the growth of wheat. The cultivators, however, do not depend entirely on rainfall, but artificial irrigation from canals and wells is also practised. The soil is very carefully prepared between August and September and some light doses of manure are applied, while sowing starts in October. In areas which are not irrigated, the cultivators have to depend on the moisture which the soil had conserved during the preceding rains. The time taken from sowing to reaping is usually 150 days during which 3 to 4 waterings have to be given. The Punjab has increased her wheat production considerably as the result of the construction of her fine net work of canals. The attention of the Government was early drawn to the possibilities which the waste lands between the great rivers of the Punjab had if they could be irrigated. An Irrigation scheme was drawn up and canals were taken off from the Sutlej and Ravi in 1885. The success of this project was very great. Not only did it reclaim over 400,000 acres and make them fit for cultivation but it gave the Government a return of over 30 per cent. upon the outlay. The land was divided into squares and was leased out to families of settlers by the Colonisation Officer at nominal rates. The policy was to prevent the concentration of land into a few hands and to secure a wide distribution of the area among a large number of persons. The extension of these canal systems has resulted in the Punjab having the largest irrigated acreage in India with 11,200,550 acres. The Punjab has also the largest irrigated acreage under wheat amounting to 5,099,725 acres. To-day the Punjab Canal Colonies grow the best wheat in India and much of the exports are from these acres.

Wheat is also grown in the Bombay Presidency, the Central Provinces and Central India as a "dry crop on deep moisture—holding black soil." Bombay has 2,314,405 acres,

and Central Provinces 3,513,009 acres, under this crop. The districts of Saugor and Hoshangabad in C. P. have the highest percentage under wheat, while in Central India, specially in Gwalior, Bhopal and Kotah as well as in the Betul, Chhindwara, Narsingarh and Jubbulpore Districts of the Central Provinces the percentage of the wheat acreage to the net cropped area is between 20 to 40. In the Bombay Presidency, however, the percentage nowhere exceeds 20, the principal wheat growing areas being Broach, West Khandesh, Nasik, Ahmednagar, Bijapur, Belgaum and Dharwar. The preparatory tillage is started before the monsoon in order to enable the soil to retain the moisture and sowing is done in October. With the completion of the Sukkur Barrage in Sind in 1932 a great impetus has been given to the extension of wheat cultivation. In course of 2 years from the opening of the system, the acreage under wheat irrigated by the canals has gone up from 1,83,043 in 1930 to 7,00,230 acres.

The export trade in Wheat depends on the home demand as only the surplus is usually exported. In years of bad harvests as in 1908 and 1919 the export trade contracted while in 1912 and 1925 it reached very high points. India enjoys a great advantage in this trade in being able to send wheat during the interval between the harvests of South America, Australia and North America, so that her supplies reach Europe at a time when the European Market is almost exhausted, hence the busiest exporting season is from May to July. Formerly Calcutta was the principal centre for the export of wheat as the E.I. Railway furnished the chief means of transport, but gradually the trade was diverted to Bombay while now-a-days, as the result of the development of the Canal Colonies in the Punjab and the establishment of quicker railway communication, Karachi is now the principal port for the export of wheat. She exported in 1918, 410,127 tons of wheat as against 39,613 tons sent by Bombay. Karachi has a further advantage in the low rainfall and the consequent lack of humidity which are of great importance in the maintaining the quality of the

wheat. The principal customers of Indian wheat are the United Kingdom, Belgium, France, Italy, the Netherlands; and Egypt. The hard wheat grown in Central India is in demand in France and Italy where it is used in making Macaroni.

Though this crop is so very important to India both for home consumption as well as for export, yet the yield per acre is quite low. India produces only 10 bushels of wheat per acre, while the U. S. A. produces 13.5 and Canada 12.8 and even the old countries like France (19.8), Germany (26.8) and the United Kingdom (32.1) have heavier yields. This meagre output is due partly to the primitive methods of cultivation and also to the low yielding varieties cultivated. Owing to extreme poverty and ignorance, the Indian farmers cannot adopt the modern agricultural implements or adequately manure and irrigate their fields and the result is the gradual impoverishment of the soil as a result of this long continued soil robbery. The indigenous varieties of wheat have a weak straw and are liable to succumb to the attacks of rust. It was at first attempted to grow better yielding Australian varieties, but this attempt did not succeed. Then it was decided to improve the local varieties, at first by careful selection and by creating a new and better variety by hybridization. The researches carried out by the Department of Agriculture in this direction have resulted in the propagation of many new varieties, e.g., Pusa 4, Pusa 12, and Pusa 52 which in addition to high productive capacity possess strong straw, can withstand rust and do not shed the grain. These varieties are fast spreading all over the U. P. and Bihar and it has been estimated that these varieties would increase India's profits in wheat by over Rs. 423 lakhs annually.

Indian wheat had at one time a bad reputation in the European market owing to the presence of dirt and it was believed that this was due to bad methods of threshing. This idea has, however, been dispelled and "Indian wheat is well packed and graded and it is almost the only grain which is always sold on the basis analysis for impurity, its quality

is usually very even and the allowances which have to be paid by the seller to the buyer for inferiority of quality are usually of minor importance." This great improvement is chiefly due to the form of contract introduced by the London Corn Trade Association in 1912 by which nothing is paid for any other foreign substance than barley. The system of storing, cleaning and grading wheat in elevators which has revolutionised the industry in Canada and the U. S. A. has not yet been introduced in India on a large scale.

Besides the export of the grain a large quantity of it is also milled in India for the production of wheat flour, which is of three kinds,—Sujji, Atta and Maida, which represent three grades of flour according to fineness. Maida is mainly consumed by the higher classes while the Atta in the form of home made bread or chapatti forms the main food of the poorer people in the Punjab and the U. P. Small flour mills driven by oil or electricity have sprung up in many towns in India, while large mills are situated usually either close to the wheat producing areas, as Cawnpore and Delhi or at ports of export like Calcutta and Karachi. The flour is mainly exported to Egypt, Turkey, Mauritius, Ceylon and the United Kingdom. Bakeries have been started in all towns and in villages close to Cantonments or Mills while the baking industry on modern scientific lines has developed only in Calcutta and Bombay. The biscuit making factories of Calcutta and Delhi have within a short time acquired a wide reputation for good quality.

The future of the Indian foreign trade in wheat lies in the production and export of high grade strong wheat. Indian wheat is prized in England owing to its great dryness but it lacks in gluten and in what bakers call "Strength." The introduction of this "Strength" in varieties of Indian wheat will secure a wider market in Europe and will enable India to get a proper value for her wheat.

MILLETS.

The poor man cannot often enjoy the delicacy of a rice or wheat meal, his staple food in many parts of India, *e.g.*, Bombay, Madras, the C. P. and U. P. are *Juar* (Sorgham) and Bajra, hence *Juar* stands third among the cultivated crops in acreage covering an area of 21 million acres. These are grown in the rains as well as in winter. Black soil with a moderate rainfall is very suitable for its growth, while one variety of it is also grown on alluvial soil. As a *Kharif* crop it is cultivated along with various pulses such as *arhar*, *mung*, *urid* and *sesamum*.

In Jhalawar State, the sorgham acreage is as high as 80 per cent. of the total cropped area, and the percentage in the Bijapur and Sholapur districts of Bombay Presidency is over 50. It is considered to be an important crop in Berar, in the Kistna, Kurnool, Nellore, Coimbatore and Madura districts of the Madras Presidency, Satara, Belgaum and Ahmedabad districts of Bombay, the Hamirpur and Banda districts of the United Provinces and the Rhotak district in the Punjab.

The harvesting takes place in October and November and when the stalks are strong and high, they are cut with a sharp edged sickle, but where the stalks are fine and the crop shrubby, they are partly cut and partly uprooted with a blunt sickle. In the Deccan the average yield is from 500 to 900 lbs. while in Northern India, a rabi crop produces 600 to 700 lbs. per acre. The grains are consumed by the people while the stems are used as fodder. The Agricultural Department has succeeded in increasing the yield of *Juar* by 25 per cent. in Gujerat by adopting the method of planting on ridges instead of on level land specially where the soil is water-logged.

MAIZE.

Maize loves a warm climate with occasional rainfall during the growing period on fertile dark coloured soil capable

of retaining moisture. It is therefore widely grown in Bihar on 1,694,000 acrs, in the U. P. on 2,125,000 acres. the Punjab on 1,004,410 acres, N. W. F. Province on 449,000 acres. Madras and Bombay also grow it in some of the upland districts. It thrives well in areas which have bright sunshine and are free from water-logging. This crop is mainly consumed by man and beast and the export trade, which rose very high in 1916 due to the failure of the Argentine supplies, is gradually diminishing. Karachi and Rangoon are the main ports for export and the principal customers are the United Kingdom and Japan. Maize production in the United States has, by the introduction of machinery, eliminated hand labour, but primitive methods are still persisting in India. The Department of Agriculture is trying to reduce the labour cost in production by insisting on sowing in straight rows with a view to carry on the weeding with bullock power. In the U. S. A. about 75 per cent, of the crop is consumed by hogs and horses on the farm, while the same amount is consumed by men in India and the leaves and stalks are given over to the animals.

Pulses occupy a very important place in the Indian dietary, its popularity increases as we proceed westwards. The Bengali is satisfied with *jhol* and rice, while the Punjabi will require *dal* and *roti*. The pulses are also very useful to the cultivator, as they add a considerable amount of nitrogen to the soil, hence they grow along with cereals and form a very good alternating crop. The chief pulses grown in India are *Gram*, *Mash*, *Mung*, etc.

SUGARCANE.

India is eminently suited to the production of Sugarcane and she has the largest acreage under sugarcane in the world except Cuba. In 1925-26 the world's production of Cane sugar amounted to 15,993,672 tons (of 2,240 lbs.), of which India's share was 2,923,000 tons or 18.7 per cent. The yield of sugar in India is very low as compared to that of other countries. The outturn of sugar per acre in India

is $1\frac{1}{2}$ tons as against 50 tons in Java, 20 in Mauritius and 12 in Cuba, but the real nature of the inferiority of the Indian industry becomes patent when we consider that over 75 per cent. of the Indian sugar is made in the form of *Gur*, while the figures for the other countries represent production direct from cane, which yields about 90 per cent. of refined sugar while the percentage of recovery from *Gur* hardly exceeds 50.

The Indian production is not sufficient for the satisfaction of the home demand and 23 per cent. of the total consumption which is about 3 million tons, has to be imported. During the decade preceding the commencement of the war there was a general rise in the *per capita* consumption of Sugar all over the world and the rise in India was by about 15 per cent. The *per capita* consumption in India in 1926 may be estimated to be 27 lbs. as compared to 98 lbs. in the U. S. A., 97 lbs. in Denmark and 94 lbs. in the United Kingdom

Sugarcane is a tropical plant and it flourishes on a fertile soil free from water-logging, having moderate rainfall and a high temperature with high humidity. Firm loams or light clay soils are suitable for its growth. Of the 3,444,000 acres under sugarcane in 1934-35 over 90 per cent. is in Northern India, 1,488,000 acres or about 55 per cent. being in the United Provinces alone, the Punjab has an acreage of 425,730 and Bihar and Orissa, 284,000, while Madras which grows a thicker variety of cane, has an acreage of 114,700. The expansion of cane cultivation in the different Provinces will appear from the following tables:—

PERCENTAGE OF CANE ACREAGE TO TOTAL
CANE ACREAGE IN INDIA.

| Provinces. | 1926 | 1930 | 1932 | 1934 |
|------------------|---------|------|------|------|
| United Provinces | .. 55°9 | 55°0 | 54°9 | 51°7 |
| Punjab | .. 15°5 | 15°7 | 16°8 | 14°7 |
| Bihar and Orissa | .. 10°1 | 10°5 | 9°3 | 9°7 |
| Bengal | .. 6°2 | 7°0 | 8°0 | 8°4 |
| Madras | .. 3°9 | 4°2 | 4°0 | 3°7 |

Owing to the restriction in the acreage under jute in recent years, sugarcane cultivation is expanding rapidly in Bengal and sugar mills are being started at important centres like Jalpaiguri. In the Province of Bihar, of the total cane acreage Tirhut Division accounts for 45.8 per cent., Patna Division 34.6, Bhagalpur Division 13.8 and Chotanagpore 5.2. Though the Province of Orissa is entirely within the Tropics, the expansion of cane cultivation on a large scale has taken place only during the last decade. In 1923-24 the approximate acreage was only 2505 and the usual varieties grown were the Khari and the Mungo cane but in 1932 the acreage went up to 11,500 out of which about 75 per cent., particularly in the canal irrigated tract, is under Co 213. In Orissa "the spread of cane cultivation, accompanied as it is by the use of improved varieties and artificial manures, consequently represents a much needed diversification of cropping and an increase in intensive cultivation. A field of sugarcane is an excellent labour savings bank."

The principal centres where the percentage of cultivation to the total cropped area is between 5 and 20 are the districts of Gorakhpore, Azamgarh, Jaunpore and Ballia in the eastern portion of the United Provinces, Bareilly and Pilibhit, Saharanpore, Muzaffarnagar, Meerut and Bulandshahr in the west and the Gurdaspur district in the Punjab. The main cane growing districts of Bihar are Saran, Champaran, Muzaffarpur, Sahabad, Patna and Gaya; of Bengal are Dinajpore, Bogra, Burdwan and Birbhum, while the Chittoor district of Madras is also important for sugarcane.

Climatological factors have in the main brought about this concentration of cane cultivation in the Gangetic valley. In this region, during the early period of the growth of the cane the monsoon gives copious rainfall from 25 to 35 inches from June to September with an average temperature varying from 85 to 90. The irrigational facilities in this region are also excellent and the soil is also rich in alluvium. The dependence of cane cultivation on irrigation in many provinces is indeed very great, *e.g.*, in the Bombay and Madras

Presidencies 98 and 96 per cent. of the cane acreage is irrigated, in the U.P. 73 per cent., in the Punjab 85 per cent., while with a heavier rainfall, Bihar irrigates 51 per cent. and Bengal 11 per cent. of their cane acreage. In the Province of Bihar over 97 per cent. of the cane crop in the Districts of Patna, Sahabad, Monghyr and Gaya is irrigated and in the Province of Orissa, this standard has been attained only in the District of Cuttack. The Sone Canal system in Bihar is responsible for the high percentage of irrigated cane acreage in the Shahabad, Patna and Gaya Districts.. This system starts at Dehri where, from the left bank of the Sone, a canal takes off, branching later on as the Buxar, Dumraon and Arrah canals, while the right or east bank canal has only one main branch known as the Patna Canal. This system commands a tract of 1,586,000 acres of which about 850,000 acres can be irrigated annually. The advantages are however to a large extent counterbalanced by the marked seasonal fluctuations and wide extremes of temperature which are noticed in this region, thus reducing the period of growth and affecting very seriously the quality of the cane. Southern India has a thick variety of cane, and the high temperature is favourable for its growth but as the rainfall is not sufficient and the irrigational facilities are not ample, exxpansion of cane cultivation is very slow. The Department of Agriculture has succeeded in introducing several early ripening varieties in Northern India with a view to increase the yield.

The acreage sown with improved varieties is rapidly increasing. In the U. P., the most popular varieties are "S48" in the western and "Co 213" in the eastern part, the area under them having increased from 281,000 acres in 1929 to 515,000 in 1930. In the Punjab the popular improved varieties are "Co 213", "Co 205" and "Co 223" while in Bihar the standard varieties are "Co 213" and "Co 214". At the Coimbatore Sugarcane Breeding Station great success has been obtained by making crosses between Sugarcane and Juar, and the hybrid cane takes only six months to mature.

It has been already stated that the cane is mainly converted into *Gur* after crushing is done in iron mills worked by bullock power. *Gur* making is essentially an important industry in the U. P. The total production of *Gur* in 1929-30 was 2,761,000 tons as compared with 2,704,000 tons in 1928-29. The production of Sugar by modern factories in India during 1928-29 amounted to 99000 tons. In May 1930 on the motion of the Imperial Council of Agricultural Research the Government of India directed the Tariff Board to enquire whether protective measures were necessary for the sugar industry. In January 1932, the Sugar Industry Protection Act was passed by which protection was given to the industry for a period of six years at the first instance, with a possibility of its being extended for a further period of eight years. A duty of 25 per cent. *ad valorem* has been imposed on molasses and a duty of Rs. 7/4/-, per cwt. on imported sugar. This has given a great impetus to the industry in Northern India and by the end of 1933 as many as 24 new factories commenced working. Refined sugar is made in modern factories which make it direct from the cane or from *Gur* if its price is favourable. In 1932 there were 32 factories in India producing a total quantity of 487,120 tons of sugar whereas in 1934 there were 141 factories with an output of 779,600 tons. Of these 69 were in the U.P., 34 in Bihar and 11 in Madras. In 1935 the number of factories has gone up to 156 with an output of 1,100,000 tons. Sugar milling must be carried on very close to the area of cane production as considerable wastage in the juice content takes place if the canes are not crushed within a short time of the harvesting. In North Bihar the localisation of this industry is quite noticeable. The District of Saran has about one third of the Mills in the Province, while the Districts of Champaran, Darbhanga and Muzaffarpur have also a large number of mills. In recent years, the sugar mills have been started in South Bihar as well, e.g., at Bihta, Dehri; Khagoul; Jamui and Bakhtiarpore. The factories in some cases have their own plantations while in other case canes are transported to them in fast railway trains. The sugar imports were

valued at Rs. 1,551 lakhs amounting to 940,000 tons in 1929 of which Java supplied 75 per cent. but between 1931 and 1933 the imports have declined by 27 per cent. Considerable quantities of Beet sugar were imported from the United Kingdom, Germany, Hungary and Czecho-Slovakia. Sugar is also made in India from the date palm, the centre of production of which is Eastern Bengal. Palm sugar is made on a large scale in the deltaic districts of the Madras Presidency.

FRUITS.

No wonder that India with her diversity of climates and soils should grow a large variety of vegetables and fruits. It is a matter of regret that though these form part of the daily food of the vegetarian population, very little has been done to improve their production on scientific lines. The cultivation of fruits and vegetables engaged about 4,895,669 acres out of 262,913,000 acres sown in British India in 1932 but this acreage has remained almost stationary. The regions producing fruits of temperate and sub-tropical zones are the district round Peshawar in the N. W. F. Province, Quetta in Baluchistan, the Kangra and Kulu valleys of the Punjab, south Kashmir, Kumaon hills in the U. P., the hill districts of Assam, central portion of the Central Provinces, the Konkan district of Bombay and the Nilgiri and Anamalai hills in the Madras Presidency. These districts have a long winter with moderate rainfall and the hill slopes furnish a good drainage for the out-flow of water. The North-West Frontier Province grows grapes, peaches, plums, pears, pomegranates, loquats and dates. Pomegranates are extensively cultivated in the Peshawar district and are exported to all parts of India. Among the Geographical factors which have influenced fruit culture in the North-west, the most important are (1) protection from the drying west winds which dry up the soil and induce heavy respiration. The cultivators try to prevent the damage by putting up high mud walls and by planting the trees very

close. (2) The growth of the plants is arrested during the month of June, July and August, owing to the high rise in the soil temperature, (3) lack of water-supply which necessitates the greatest economy in irrigation and the growing of those fruits like peaches which require less water. Then again the selection of the actual varieties of the fruits which are grown in these parts is governed by their cropping power, ability to travel long distances in good condition and the length of their fruiting season. In the Bombay Presidency, the Districts of Poona, Kanara and Thana are important fruit growing districts with an acreage of 4,825 6,412 and 3,632 respectively. In the Poona District one notices a wide variety of fruits although orange occupies 33 per cent. and bananas 25 per cent. of the total fruit acreage of the District. The most important fruit centre of the District is the Haveli Taluka followed by Purandhar, Junnar, Shirur and Bhimthadi. In Junnar bananas, in Shirur oranges, in Purandhar figs and in Haveli guavas predominate although orange is also grown in other taluks.

The sheltered valleys and hill slopes of Kulu and Kangra are well-known for their pears, walnuts and peaches. The grape vine is also largely grown in the Poona and Nasik districts and in Kodaikanal, Dharmapuri and Perukonda in the Nilgiris and a plant goes on bearing for 60 to 100 years. The vine yields sweet grapes from January to March and sour grapes in August.

The crop grows well on sheltered hill slopes on red or ash coloured loams having a mixture of lime stone or gravel which ensures free drainage. The expansion of the grape area is restricted by its liability to the attack of fungus diseases caused by summer humidity. This factor accounts for the great extension of vine-growing in Baluchistan which is in the dry belt. The vine-yards are irrigated there by means of underground drains connecting one well with another thus affording an easy flow of the sub-soil water of the hill slopes to the vine-yards down below. The entire trade is carried on by Peshawaris who pack the grapes in wooden boxes with cotton wool and take them to all ports of India.

The orange is one of the easiest fruit trees to grow. It commences to bear fruit within six years of planting and continues to yield about 300 fruits per year for a period of 15 to 20 years, thus at the average price of Rs. 2/- per 100 oranges, the income from one plant is over Rs. 90/- Orange is grown largely in Assam, Nagpur, Poona District, the N. W. F. Province and the Punjab. The temperature factor in orange-growing is very important as it cannot withstand a temperature below freezing point for any length of time. Besides this, it requires a heavy amount of rainfall and sufficient humidity in the air. The soil favourable to its growth must be rich in calcium and be well-drained. The Sylhet, Santara, Mosambi and the Lahore Malta varieties are well known. In the Nagpur District 5,560 acres are under oranges alone. The main problem is connected with the expansion of facilities for quick transport. The Assam orange gardens are served by the E. B. Railway and the A. B. Railway but in many cases the fruits have to be carried over long distances in head loads causing damage and loss of time. The opening of the Chera-Chatak ropeway at Cherrapunji will no doubt facilitate the quick transport of the fruits of this area. Pineapples form another important article of interprovincial trade. In Assam, the tea planters grow superior Ceylon varieties on the hill slopes with great success, while in Madras and on the west coast they attain very big sizes.

The mango is the poor man's fruit and it is grown extensively where the soil is alluvial, the rainfall is liberal and the climate is humid. Large areas are under this crop in Bihar, Bengal, Central Madras, U. P., Sind and Bombay; but the varieties which have achieved a great reputation are the Bombai, Himsagar and, Maldah of Bengal, Hijli, Langra and Sepia of Bihar, Carnandin, Momrad and Alphonse of the Kanara district of Bombay and the Beganapalli and Totapuri of the Godavari district. The mango season is from June to August in North India and earlier in the south. A short time before the fruits are ripe, agents of *beparis* visit the fruit growers and purchase the produce of

trees on the wholesale system, and taking advantage of the growers' lack of knowledge of the market conditions try to keep down prices and drive good bargains. They transport the fruits either by boats or trains to the nearest towns. In 1932 an attempt was made to export mangoes to England. The fruits found a ready market in London and the success of this experiment has encouraged this year fruit growers of the Bombay Presidency to export not only mangoes, but bananas and jackfruits to England and the Continent. Large cities are great markets of fruits and vegetables and with the gradual increase in the per capita consumption of fruits in our cities in recent years the demand for fruits has considerably increased and more distant centres of production are being tapped. Calcutta obtains her supplies of mangoes from (a) the Madras Presidency, (b) Bengal Presidency, (c) United Provinces and (d) the Province of Bihar. From the end of April inferior varieties of mangoes come from Calicut, followed later on by consignments from the Godavari, Vizagapatam and Salem Districts. The Langra season in Bengal being earlier than that in Bihar, imports of this variety as well as Bombai, Hemsagar, Mohanbhog and Krishnabhog are made from Central and Northern Bengal. The Benares Langra and the Lucknow Safeda along with mangoes from Moradabad, Rampur and Mahliabad have a ready market in Calcutta. Bihar supplies on an average 200,000 baskets of mangoes every year, the main exporting centres being Bhagalpur, Sabour, Rajmahal, Colgong, Laheriasarai, Rajnagar, Muzaffarpur and Dinapur. The fruit requirements of Bombay City are met by consignments of mangoes from Ratnagiri, Surat and Thana; of oranges from Poona, Ahmednagar and Khandesh; of grapes from Nasik, Poona and Ahmednagar; of guavas from Poona, Nasik and Satara; of tomatoes from Surat, Nasik and Poona and lemons from Poona, Nasik, Ahmednagar, Kaira and Khandesh. In addition to these Bombay imports apples from Japan, Australia, and South Africa; oranges from South Africa, Palestine and Italy; lemons from Italy; grapes from Spain and pineapples from East Africa. The

average imports of homegrown fruits and vegetables to the Bombay City amount to 1,800,000 packages and 70 waggon-loads annually.

The expansion of fruit-growing is seriously restricted at present, not so much by geographical factors but by the primitive methods of transport and marketing. The fruit-growing centres, for example, in the Kulu and Kangra valleys and in the Assam hills, are mainly inaccessible regions far away from the rail head and the only method of carrying them is on head loads or on pack mules. Even in places close to urban markets, the lack of suitable transport facilities is standing in the way of the expansion of fruit-growing on a commercial scale even though the soil and climatic factors are favourable. The fruits usually are picked when green and unripe, and the branches are shaken for taking them down so that many fruits get damaged at this stage. They are then packed in old Deodar wood boxes or in wicker baskets of different sizes causing a general lack of ventilation. Most unsuitable material, as grass and leaves are used for packing and these bring on fermentation quickly, so that before the fruit reaches the railway van, decay usually sets in. The entire crop is in some cases sold to a merchant or sale is made through commission agents, but in either case the grower does not get the full remuneration of his labour. In order to improve the system of transport, the containers should be standardised as this will bring about an increase in business efficiency and the small growers should be encouraged to agree to carry on transport in bulk. Dr. Howard has, after various experiments, recommended new designs for bamboo peach baskets. The Railways, e.g., the N. W. Railway, are running ice cooled vans for the transport of delicate fruits and it is necessary to develop cold storage rooms or refrigerator depots in the principal markets of India. If these are done, if the growers and the railway authorities co-operate, horticulture will become a paying industry and India will be able to secure a large home demand. Fruit preserving and canning render fruits available at all times of the year to the consumer.

The development of this industry will depend on the surplus of the produce after the home demand is satisfied and it is proper that an attempt should be made to develop this industry by experimenting an attempt should be made to develop this industry by experimenting on one or two fruits which are widely distributed throughout the country, like mangoes and oranges. During the War, mangoes were preserved and exported in large quantities from Muzaffarpur in Bihar and three factories in the Konkan are working on these lines. Calcutta has a large factory, fully equipped with up-to-date appliances for bottling and canning. It makes jams, chutnies, pickles, condiments and curry powder.

CHAPTER III.

OTHER IMPORTANT CROPS.

TEA.

Tea drinking has become widespread in modern India, even the poorer people cannot do without a cup of tea daily, but the per head consumption is only .18 lbs. as compared to 9.20 lbs. in the United Kingdom. A widespread propaganda is being carried on for increasing the consumption of tea. The Indian Tea Cess Committee have purchased 700 Gramophones, 8,000 vernacular records, 200 Harmoniums for helping to popularise tea rooms in India. In Calcutta alone, the number of tea shops rose from 444 in 1915 to 1,920 in 1917.

Though this plant is of indigenous origin, it was not discovered until the middle of the last century when the efforts of the Indian Government to plant the Chinese variety failed, and it was found that Assam contained a better variety of tea which grew in abundance. Government took up the enterprise and in 1865 the Indian product was considered strong enough to compete with the Chinese tea in the London market and in that year, the Government ceased to have any direct connection with the industry. Tea flourishes in a warm sub-tropical climate, with a steady rainfall not exceeding 70 inches annually. The soil should be light enough to allow roots to get through. As water-logging is injurious, the plants are grown on well-drained hill slopes. These conditions are chiefly to be found in Upper Assam, which grows the largest amount of tea in India (258,942,000 lbs. in 1931), while North Bengal is a good second. Tea is also an important industry in Madras (Nilgiris), Travancore, Mysore, the U. P. (hill districts), Tripuna State in Bengal, the Punjab, Burma and Chota-

Nagpur in Bihar. In the manufacture of tea, machinery is being gradually introduced all over the country. After the leaves are plucked, they are spread out on trays to wither, after which they are uniformly pressed and rolled when the change of colour from green to brown takes place. Hot air blasts are employed in drying the leaves after they change colour and then the tea which is known as black tea is ready to be tinned and despatched. Orange Pekoe is the highest grade of this type of tea, while Pekoe, Souchong, Congou and Fannings are inferior qualities. Tea is packed in airtight lead lined boxes made of pine, teak or venesta wood and large quantities of timber have to be imported from China, Japan, Sweden and Russia for the purpose. In Darjeeling tea estates these chests are carried on a chair-like frame work made of wood, which are supported by a strap round the forehead of the cooly, to the nearest railway station where they are loaded on the trucks for transport to Calcutta. The export of tea is brisk during the period between July and December. India exported in 1934 over 318 millions lbs. of tea, out of which 86 per cent. went to the United Kingdom, 1.3 to the rest of Europe, 7.5 per cent. to the United States, 1.4 per cent. to Australia, 2.0 per cent. to Persia and Turkey. Before the War, Russia was an important market for Indian tea, but we have entirely lost this trade. Through the efforts of the International Tea Committee an attempt is being made to revive exports of black tea to Russia by selling on credit through the Anglo-Russia Tea Trading Company. There is a considerable amount of trans-frontier trade in it. Brick tea is imported from Tibet and Nepal, while India made tea is exported to Afghanistan. From 1928 a decline in the prices of Tea set in and this is still continuing. The principal causes of this prolonged slump are over production and severe competition from Java and Sumatra. In 1930 the tea growers of India and Ceylon decided by mutual agreement to restrict the output, and this was confirmed by the Government of India in 1933. Under the Ottawa agreement Indian tea has been granted preference by England and it is expected that this will to some extent neutralise the com-

petition of Java in the English market. On the exports of tea, the Indian Tea Association has levied a cess of $\frac{1}{4}$ pie per lb. which amounts to about £30,000 annually. This fund is utilised in financing the propaganda for developing the tea drinking habit. Not only does this propaganda aim at developing an extensive home market but also a market for black tea in the United States. A Tea Commission was sent to that country in October 1934 and they were of opinion that with proper publicity and supply of good quality of tea, the drinking of tea could be made more popular than coffee and a large market in this way could be secured. Ninety per cent, of the exports pass through Calcutta and Chittagong, while Tuticorin, Cochin and Calicut are the principal ports of export for South Indian tea.

The tea gardens in North India are owned by joint-stock firms mainly under European control, while the majority of the gardens in South India are owned privately. The labour force in the industry in India amounted to 860,500 in 1933 and these labourers have to be recruited from distant provinces like U. P., the C. P., B. and O. and northern districts of the Madras Presidency.

COFFEE

Coffee is a tropical plant requiring a rich soil, a fair amount of rainfall and warm temperature. It is usually grown in altitudes varying from 1,500 feet to 2,500 feet. The principal Coffee growing areas of India are in the extreme south where all these conditions are present. The Nilgiris, Coorg and Kadur in Mysore grow the largest quantity of Coffee in India, while it is cultivated also in Travancore, Cochin, Ratnagiri, North Kanara, Cachar and Myitkiana and Bhamo in Burma.

About one-half of the world's coffee supply comes from Brazil, while Ceylon and Java also export in large quantities, but the Indian coffee, which is grown mainly for export commands a higher price owing to its superior quality. In 1926 there were 3,152 plantations with an area of 256,390

acres, of which Mysore accounted for 52 per cent. and the share of Coorg was 16, Madras 30, Cochin and Travancore 1 per cent. each. The coffee estates in the Nilgiri Hills are not well served by railways, hence the crop is transported in carts to the centres of curing, *viz.*, Mangalore, Tellicherry and Calicut as these are also the ports for export. Owing to the competition of South American coffee, the export trade has declined in recent years from 272,600 cwt. in 1919 to 205,000 cwts. in 1925. The United Kingdom, Germany, the Netherlands, Norway, France and Belgium are the principal customers of Indian coffee, which is also sent to Arabia, Mesopotamia, Australia and the Bahrein Islands.

OILSEEDS

The acreage under oilseeds in India has increased from 10,472,675 in 1918 to 15,882,400 in 1931-32. Oilseeds are very important alike from the point of view of agriculture and as an article of export. India has a large share of the total export trade of the world and she holds the monopoly in Castor, Mowra and Niger seed, while her share in the world's trade in Linseed is 24 per cent., in Groundnut 45 per cent., in Cotton seed 33 per cent., Rape and Mustard seed 66 per cent., Poppy seed 75 per cent. and Sesamum 40 per cent. In addition to the seed India also exports large quantities of oils and oil cakes.

The following table shows the acreage under the different seed crops in India in 1931-32 :—

| | | | | |
|------------------|----|----|-----------|-------|
| Linseed | .. | .. | 2,216,600 | acres |
| Sesamum | .. | .. | 3,712,468 | „ |
| Rape and Mustard | .. | .. | 3,506,882 | „ |
| Groundnut | .. | .. | 4,226,008 | „ |
| Cocoonut | .. | .. | 617,858 | „ |
| Castor | .. | .. | 514,497 | „ |
| Other oil seeds | .. | .. | 1,088,087 | „ |

The importance of Linseed is greater than that of the other oil seeds as it is grown principally for export, either in the form of seed or the oil. It is cultivated solely for seed, though in temperate climates in Europe, it is grown for the fibre also. It grows on clay soil rich in alluvial deposit. If the soil has sufficient moisture, heavy rainfall is not required. In the United Provinces and Bihar it is grown as a mixed crop along with wheat, rape seed and pulses, but in the Central Provinces, it is cultivated alone as a *Rabi* crop. The Central Provinces have the largest area under Linseed with 937,224 acres, Bihar and Orissa is second with 654,100, U. P. comes next with 321,256 and Bombay and Bengal have 110,000 acres each. The eastern portion of the Central Provinces including the districts of Wardha, Chanda, Drug, Raipur, Bilaspur; Balaghat; Bhandara and Nagpore forms the principal Linseed Belt of Southern India as the black cotton soil and an average rainfall of 50 inches furnish the ideal conditions for the cultivation of this crop. In the Gorakhpur district of the United Provinces, linseed occupies one-fourth of the total cropped area. The principal linseed growing areas of Bihar are Saran, Muzaffarpur, Shahabad and Monghyr, of Bengal are Nadia and Rajshahi, of Bombay are Nasik and Bijapur. The northern portion of Kashmir also grows linseed. Two varieties of linseed are usually grown, yellow and brown, the former is cultivated in the Central Provinces and is exported from Bombay. Bihar and the U. P. grow the brown variety and the grains of the seed grown in North Bihar are smaller than the grains of South Bihar and the Central Provinces owing to the predominance of sand in the soil of North Bihar.

France and the United Kingdom take among themselves more than one-half of our exports of linseed, while Italy accounts for 15 per cent., Belgium 9 per cent. and Germany 6 per cent., but during the War in 1919, the United Kingdom took 83 per cent. of our exports while France and Italy only 2 and 5 per cent. respectively.

The seed is pressed in this country in primitive presses, but extraction on modern lines is being developed near about the port of Calcutta and also in the centres of cultivation in North Bihar. There are three big linseed oil mills near Calcutta which produce more than 1,300,000 gallons of oil. These mills get their supplies of seeds from the Central Provinces as well as from Bihar and the United Provinces and export the surplus oil from the port of Calcutta to Hongkong, Australia and New Zealand.

Groundnut cultivation has experienced many vicissitudes in the course of its history but it enjoyed very prosperous times during the War. The area under Groundnut in 1931-32 amounted to 4,226,008 acres of which Madras Presidency accounted for 2,635,427 acres, Bombay 989,224 and Burma 408,309 acres. Groundnut grows best in a dry, sandy soil and it requires a moderate rainfall. Groundnut in Madras extends over the coastal districts of Chingleput, South Arcot, Tanjore and the neighbouring districts of Trichinopoly, North Arcot and Cuddapah having an annual rainfall between 30 to 40 inches. Tumkur in Mysore with its dry red soil and a rainfall below 25 inches is also suitable for Groundnut. The other areas of cultivation are Vizagapatam and Ganjam on the eastern sea board, and the dry districts of Sholapore, Satara and Belgaum in the Bombay Presidency and in Central Provinces. Burma grows a considerable amount of Groundnut in the dry districts of Pakokku, Myingyan and Magwe where the rainfall is below 25 inches. About 52 per cent. of the total yield is exported mainly after the decortication of the nut. Prices of the nuts shipped in the shell are higher but owing to the prohibitive sea freights, it does not pay the exporter to send in this condition. The principal ports engaged in the export of Groundnut are Madras, Cuddalore, Porto Novo, Negapatam, Pondicherry and Rangoon but owing to the lack of storage and shipping facilities in the minor ports of the Presidency, the entire trade is gradually being localised in Madras. About 33 per cent. of the exports go to Marseilles in France, while Italy takes about 13 per cent.

The Indian uses for cooking purposes mainly mustard oil and ghee but in Southern India, Cocoonut and Gingelly oils are largely consumed. Rape and mustard seeds are extensively cultivated in Northern India alone, as a *Rabi* crop, either pure or mixed with other crops. The U. P. has 40 per cent. of the acreage under Rape seed while Bengal has 22 per cent. and Bihar 10 per cent. Rape seed is crushed for home consumption in the village press or *ghanis* drawn by bullocks, but in small towns, oil power is gradually being used to crush the seeds. The oil cake is very valuable as cattle food and also as manure. We export about £50,000 worth of oil to Fiji, British Guiana and South Africa, while the exports of Rape seed are mainly destined for the United Kingdom, Japan and Italy. The centres for the oil crushing industry are located in the heart of the rape seed growing area, viz., Cawnpore in the U. P. and Ferozepore in the Punjab while Karachi and Bombay are the chief ports for export. Sesamum flourishes in a tropical climate, hence though grown in almost all parts of India, it attains its maximum yield south of the Vindhya, e.g., in Bombay, Madras and C. P. Sesamum oil is exported to Ceylon, Straits Settlements, Mauritius and East Africa, places where the labourers from Southern India have settled.

The Cocoonut palm has been called the poor man's mine, so many possibilities it affords for the economic utilisation of the various parts of the tree. Copra is the dried kernel of the nut, after the oil has been extracted out of it, and the coir comes out of husk round the nut. Cocoonut palm thrives in sea coast districts where the mean temperature varies from 75 to 85°F. and the rainfall is well distributed and the soil is well drained. The Cocoonut Belt therefore extends from the Kathiawar to the Kanara district of Bombay in Malabar, in the Godavari Delta, Travancore and Cochin, Lower Bengal along the banks of the Ganges and Brahmaputra and in the Orissa coast. The fruit is consumed raw while the oil is used in cooking and the total home consumption of the fruit exceeds 400 million nuts per annum. A considerable amount of trade is carried

in the Copra, which is made by drying the kernel of the nut on the sands by the sea shore. Before the War Germany took about 73 per cent. of the Indian exports of Copra for manufacturing margarine, but she has lost this trade, and her place has been filled by France and the United Kingdom. There is a great demand for Cocoanut oil not only for edible purposes but also for soap-making, and the Malabar oil known as Cochin oil is extensively exported from Cochin, Calicut and Alleppy, where power mills have been started. In recent years factories have been started at Ernakulam and Pondicherry for manufacturing Coco-butter which is sold as Cocotine or Cocogem, as a substitute for *ghee*. Calcutta is fast developing a cocoanut oil industry by crushing Copra imported from Ceylon, which is possible owing to the very cheap rates of sea freight.

TOBACCO

As a mild stimulant, tobacco has long been consumed in India in various forms, in smoking tobacco in the *hookah*, in the form *Biri*, Cigars or Cigarettes, in the shape of snuff or by eating or chewing tobacco. The smoking of Cigars and Cigarettes has increased by leaps and bounds and within the last decade it has succeeded in displacing to a considerable extent *hookah* tobacco. The annual consumption of Cigarettes in India is now 6,500 million compared with 1,000 million ten years ago. This brings the *per capita* consumption in India to about 21 per annum.

Tobacco thrives in a light soil rich in humus, having sufficient depth for the development of the roots of the plant. The climatic factors are heat in summer with copious rainfall from July to September. The tobacco cultivation is suitable for small holdings, preferably close to the growers' homestead as infinite care is required, hence tobacco is a common crop in areas where a minute fragmentation of holdings has taken place. Tobacco is grown in the Rungpore and Jalpaiguri districts of Northern Bengal, North Bihar, in the districts of Coimbatore, Vizagapatam, Trichi-

nopoly, Godavari and Guntur in the Madras Presidency, in the Belgaum district of Bombay, in the Etawah and Mainpuri districts of Minbu, Thayetmyo, Prome, Toungoo, Henzada, Sandoway, Kyaukpu and Northern Arrakan in Burma.

Two varieties of tobacco are commonly grown, *Nicotiana Tabacum* in Southern India and *Nicotiana Rustica* in the North. The Indian tobacco does not possess all the characteristics of good quality tobacco, *e.g.*, sweet, flavour, medium strength and capacity to burn evenly. It has not yet attained the quality of Sumatra, Virginia, Havana or Turkish tobacco, but by the efforts of the Department of Agriculture considerable improvement in the variety as well as in the method of cultivation and curing have been made. The future prosperity of the tobacco industry in India lies in the successful production of the cigarette type of leaf. "Pusa 28" has become popular and crosses between this variety and the American "Adcock" have shown encouraging results and it is hoped that this variety with fluecuring will compare very favourably with the best American varieties.

A considerable quantity of the raw tobacco is consumed by the people in *hookas*. The *hookah* tobacco is specially prepared and treacle is mixed with it. Places like Gaya in Bihar, Vishnupur in Bengal and Lucknow in the U. P. are well-known centres of this industry. A large quantity of unmanufactured tobacco is exported from Madras, Bombay and Burma, the principal destinations being France, Aden, Straits Settlements and the United Kingdom. The leaf is partly or wholly cured in curing factories situated in the tobacco-growing areas.

Though Bengal is by far the most important tobacco-growing Province, no cigarette manufacturing industry on a large scale has yet been started. The Peninsular Tobacco Factory at Monghyr uses Rangpur as well as North Bihar Tobacco. Southern India and Burma have important centres for manufacturing cigars, but these are made with imported leaf wrappers as the Indian tobacco though good

as filler is unsuitable for this purpose. The centres of this industry in Madras are Trichinopoly and Dindigul, Palghat and Cocanada while the Burma centres are Rangoon, Moulmein and Akyab. These cigars have a ready market in the Straits Settlements, in the United Kingdom, Siam and Aden. About half of the exports come from Burma, while Bombay sends 21 per cent. and Madras 14 per cent.

India grows about 40 per cent. of the total quantity of tobacco produced in the world and about 90 per cent. of the total quantity grown in the British Empire. Only about 2 per cent. of the quantity produced is exported, the remainder being locally consumed. The imports which in 1930-31 amounted to about 5 million lbs. valued at Rs. 1½ crores fell to 4.2 million lbs. valued at Rs. 72 lakhs in 1933-34, whereas the exports, although they amounted to over 29 million lbs., were valued at about Re. 1 crore.

The *Biri* or the Indian Cigarette is widely smoked by the poorer classes and its manufacture is carried on in all big towns in small factories where child labour is available. The forests of Chota Nagpur and the Eastern Ghats supply the leaves which are used as wrappers for the *Biri* tobacco and large scale *Biri* factories have been started in the Bilaspur district in C. P. owing to the proximity of the supply of the wrapper leaf. Snuff making is the monopoly of Southern India, Madras and Madura being the chief centres.

RUBBER

With the development of the use of automobiles Rubber has risen to a considerable extent in international importance. Excepting the Brazilian production of wild rubber Southern Asia is the principal source of rubber plantation in the world. The Malay Peninsula alone has more than 50 per cent. of the world's rubber acreage. Rubber is essentially an equatorial plant requiring high temperature and copious but well-distributed rainfall for its growth but it demands close attention, hence the main limiting factors to the expansion of rubber cultivation are the supply of intel-

ligent labour and well developed means of communication. The western seaboard of Southern India from Mangalore down to Cape Comorin possess all these advantages to a large extent, the temperature varies from 78° to 85° and the rainfall is well over 150 inches extending from May to December and the facilities for transport are also well developed. The chief centres of production are Shencottah and Mundakayam Districts and the Rani Valley in Travancore and various areas in Cochin, Coorg, Mysore and British Malabar. The Tenasserim coast of Burma is also suitable for rubber cultivation but owing to difficulties of the means of communications, expansion of the cultivation was at first very slow but it occupies the first place in India now. The total production in 1926 amounted to 23 million lbs. which represents about 9 per cent. of the world's total output. With a view to cope with the catastrophic fall in the price of raw Rubber in recent years the principal rubber producing countries launched in 1934 a scheme for the restriction of production and export of rubber to which India gave legislative sanction by the enactment of the Indian Rubber Control Act.

The exports of rubber have trebled in the course of nine years from 8 million lbs. in 1917 to 23,005,780 lbs. in 1926 and in 1933-34 they were valued at Rs. 31,18,000. Cochin and Tuticorin are the principal ports for the export of South Indian rubber while Mergui and Rangoon are engaged in the export of Tenasserim rubber. The bulk of Indian rubber goes to the United Kingdom, while Ceylon and United States are also important customers. The exports to the United Kingdom in 1926 were valued at Rs. 1,17,66,000.

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CHAPTER IV.

FIBRE CROPS.

In a tropical country like India, the need for protecting the body from exposure to cold is not so great as in the cold European countries, but owing to the immense extent of the country, wide diversities in climate are experienced from the mountainous and bleak North-West with a winter temperature of 30° to the Deccan table land where in January the temperature does not fall below 70° . This diversity of temperature accounts for the variety of clothing and its elaborateness in the west, *e.g.*, the Achkan, Pyjama, Muretha, Sherwani, Kummarbundh, and Goolbandh of the Punjab and the U. P., the tight trousers of Delhi, the long coat of the Punjabi male and the Orna and Langar of the Punjabi female and its gradual simplification as we travel eastwards to Bengal where the *Dhoti* and *Chaddar* form the principal dress. ☞

Our clothing is made of cotton, silk, wool or jute and the manufacture of the various items supports a large number of persons while the production of the raw materials forms some of the most remunerative industries of India.

In the Eighteenth Century the cultivation of superior varieties of cotton and the weaving of fine cloth formed the principal occupations of the people in several parts of India. All the processes of manufacture were performed by hand labour. Gradually this industry declined and the weavers took to agriculture and other occupations. The rise of the United States as the foremost cotton growing country drew the attention of Manchester to the extreme necessity of developing the cotton growing areas of India for the supply of raw cotton. Out of 19 million bales (of 500 lbs.) of cotton produced annually, United States alone contribute 12 and India only 4 and the supply of American

cotton for Lancashire mills is gradually decreasing owing to the increase in American mill consumption. Hence it has become important that the British Empire should be self-contained so far as the supply of raw cotton is concerned and India as the largest cotton-growing country in the Empire certainly offers the greatest scope for the extension in the cultivation of cotton. The solution will not consist merely in increasing the acreage under cotton in India, but in improving the quality and yield as "the average yield per acre of the Indian crop is only about 85 pounds of lint whilst that of the United States crop is nearly 200 lbs. per acre and the Egyptian crop 450 lbs." Further the Indian cotton loses about 10 per cent. more in the blow room than the American or Egyptian cotton, thus bringing down the actual average yield per acre to about 76 lbs. We grow two varieties of cotton, short stapled suitable for spinning yarn from 1 to 16 counts and medium stapled cotton for yarn up to 22 counts. Three-fourth of the total produce is short stapled while one-fourth only is suitable for spinning fined yarn and there is practically no cotton suitable for the highest counts. Hence the improvement of the quality is also very necessary for the Indian mill industry as well. Indian mills use about 80 per cent. of the medium stapled cotton produced in India and the balance which is very inferior in staple, is exported and it does not fetch a good price in the foreign market.

Cotton is essentially a plant of tropical and sub-tropical regions, and it is being grown in India under a variety of climatic conditions. In the C. P. the cotton-growing districts are the districts of Nimar, Wardha and Nagpur. The climate of this region is very hot and dry in summer with a moderate rainfall, below 50 inches derived from the S. W. Monsoon. The Bombay Cotton Belt extends from North Gujarat to Kaira growing Dhollera Cotton, South Gujarat to Surat producing Broach cotton, while the Khandesh and Sholapur Districts produce Khandesh cotton and the Dharwar and Belgaum Districts grow Kumta-Dharwar Cotton. In these four tracts there is much diversity in climatic fac-

tors. Gujerat has great heat during summer but low temperature in winter but the Karnatak Districts have a more temperate climate in all seasons except summer. Gujerat has a rainfall of 30 to 40 inches while the Deccan districts have a lower rainfall all derived from the S. W. Monsoon. The Karnatak Districts have the heaviest rainfall and they receive the major portion of it from the North-East Monsoon. In cotton cultivation the soil factor is as important as climate. The most suitable soil for cotton is the black soil with a deep, thick clay, which occurs in Berar, Broach and Surat while the soil of Nagpur is shallower than that of Berar, and the soil of Ahmedabad and Kaira as also the soil of the cotton-growing districts of Agra in the U. P. are alluvial. Cambodia cotton is grown in red soil in the Coimbatore Districts. The other cotton-growing areas in Madras are the Anantapur, Bellary, Kurnool, Tinnevely, Ramnad and Cuddapah Districts, the Guntur, Kistna, Nellore and Godavari Districts which grow the Cocanada variety. The Punjab has three cotton-growing areas, the canal districts of Lyallpur, Montgomery, Jhang, Shahpur and Multan; the Ambala and Hoshiarpur Districts grow Sind-Punjab cotton and the South-eastern Districts grow the Bengal variety which is also grown in the Bulandsahr, Muttra, Aligarh and Agra Districts of the U. P. while Cawnpore American variety is grown only in the irrigated tracts.

The Indian cotton crop may be sub-divided into early varieties and late varieties. The early varieties take about 150 days to ripen and are milk-white in colour but are short and coarse and the plants are tall with few side branches. The late varieties ripen in about 240 days and are known as "dry" crops, hence they are unsuitable for the Punjab or the U. P. where the winter is long and severe. It is mainly grown in Broach, Khandesh, Gujerat and in the Deccan districts of Madras. The cotton is of superior quality with a higher percentage of lint.

The extension of irrigation has contributed mainly to the introduction of long stapled American cotton in various parts of India. In the Punjab, in the Canal irrigated areas,

there were 30,000 acres under American Cotton and by 1921 the acreage increased ten-fold, and the completion of new canal projects is bound to send up the acreage still higher. In the U. P. any extension of canal irrigated cotton is handicapped by the fact that canal irrigation hardly extends over the whole of a village and only a small portion of the village is under cotton. The only solution of this difficulty is the concentration of irrigational facilities along channels which are considered to be suitable for the growing of cotton. In Sind the principal limiting factor to the extension of cotton is the water supply and as the result of the Sukkur Barrage and the canal system connected therewith, it is estimated that one million acres of land will grow cotton as the canals will ensure a regular water supply.

The system of marketing leaves much room for improvement. The grower is very often indebted to the village money-lender and is compelled to sell it to him immediately after the harvest at low rates and the *Mahajan* sells it to the bigger dealers who in their turn sell it to the exporters or to the ginning firms. This system not only prevents the grower from receiving a proper remuneration for his labour but also brings about a mixing up of different varieties of cotton with consequent deterioration in the quality. The Agricultural Department has attempted to improve this state of things in the Punjab by holding auction sales of the cotton crop. The sellers bring their goods to the market which is classified by the officers of the Department and bidding takes place on the basis of this classification. The buyer has to deposit four annas per maund as earnest money and has to pay the balance within three days. This system has certainly helped the growers to sell the long stapled cotton at a premium, but the adoption of this system on a big scale is only possible if the small landholders form private companies for holding these auctions. The C. P. and Berar have seriously tackled the marketing problem by passing the Cotton Markets Act by which committees have been formed for managing markets and for supervising transactions carried on there. The cultivator here gets a

chance of seeing the buyer and can secure the full competitive price for his crops. Another advantage of this system is the prevention of mixing and adulteration as the buyer gets an opportunity of seeing the article with his own eyes. The development of cotton-growing in India is intimately bound up with the extension of this system but it will succeed only in areas where the cotton in comparison to the other crops has a predominant share, *e.g.*, in the Gujerat and Khandesh area of Bombay, in all parts of Madras except the Cocanada area and in the Punjab canal colonies. Adulteration has been checked to some extent by the passing of the Cotton Transport Act by which the local Government can prevent the importation of cotton from outside the area except under licence.

In the export trade Bombay leads, followed by Rangoon, Tuticorin, Calcutta and Madras. Before the War Karachi was a big exporter of cotton but she has lost this trade. The total Indian exports of raw cotton declined from 2,369,000 bales in 1930-31 to 2,063,000 bales in 1931-32 but it increased to 2,740,000 bales in 1933-34. Japan is the most important customer for raw cotton as she takes alone 7m. cwt. followed by China (2m.), Italy (1½m.) while the share of the U.K. is 803,620 cwt. and an equal amount is purchased by Belgium and a slightly lower quantity by Germany and France. In 1917 Japan was leading, with U. K. as the second important market.

The Cotton manufacturing industry of India dates from 1838 when a cotton mill was started at Goosery in Bengal while the first Cotton mill in Bombay was started as late as 1853. To-day there are 352 Cotton mills in India with 96 million spindles and 2 million looms and 4 lakhs labourers. This phenomenal development of the industry is mainly due to the great impetus it received during the American Civil War and the last Great War, but its days of prosperity seem to have terminated as due to the development of cotton manufacturing in Japan and China coupled with industrial troubles at home, it is passing through a severe crisis. This industry is localised mainly at Bombay and Ahmedabad.

which between themselves produce about 75 per cent. of the yarn spun and 87 per cent. of the cloth made in India. Other centres are Sholapur, Madras, Madurai and Coimbatore, Nagpur and Amraoti, Cawnpore and Narainganj, Chittagong and Serampore near Calcutta. All these are located in close proximity to the cotton-growing area or as in the case of Serampore and Narainganj equipped with proper facilities for quick transport of the raw material. These mills have to import about 58 per cent. of yarn of above 40 count for making finer cloth. We have a large export trade in yarn which is set to China, Asiatic Turkey and the Strait Settlements and the handloom weavers of India also use this yarn for weaving, but owing to the gradual loss of the Chinese market, the Indian mill owners have concentrated their attention on the production of finer cloth by importing American cotton and thus Bombay alone contributes 79 per cent. of the cloth produced in India. Besides this we have some exports of woven cloth to Aden, East Africa, Persia, Zanzibar, Strait Settlements and Ceylon. Bombay had 51 per cent. and Madras 46 per cent. of this trade.

The cotton mills of Bombay and elsewhere are mainly Indian in management and capital. In Bombay city the further expansion of this industry is seriously handicapped by the lack of space which accounts for the highly undesirable condition of the ill-ventilated and insanitary houses in which the labourers have to live.

JUTE

Jute does not enter very largely into our clothing though in the making of cheap flannels, it is very often used. Its importance is very great as an industry which supports a large export trade. Jute is Bengal's monopoly and the principal cause of her prosperity and it is grown in Bengal and to some extent also in Bihar and Orissa. The area under Jute was 2,143,000 acres in 1932 of which Bengal alone contributed 90 per cent. The acreage under Jute has gone up by 400 per cent. during the last 45 years. In

Bengal, the main areas for Jute cultivation are the Districts of Dacca, Tipperah, Faridpur, Rangpur, Pabna and Mymensingh, the last named devotes one-fourth of her total cultivated area to Jute and produces 25 per cent. of the whole jute crop of Bengal. In the Province of Bihar, Purnea and Darbhanga and in the Province of Orissa Cuttack and Balasore are the chief jute growing districts.

Jute growing depends largely on two factors, (a) Climate, and (b) Water for steeping the plants.

Jute is a monsoon crop and grows well in damp heat. Ideal conditions for cultivation are occasional showers during the sowing season (March and April) with high temperature between 70° to 100° and abundance of moisture during the period of growth. The principal Jute growing districts named above have in March and April rainfall below 4 inches and in summer nowhere the maximum temperature exceeds 100°.

The abundant supply of clean water for steeping adds to the quality of fibre, hence the jute grown on the banks of the old Brahmaputra river, which has clear water, is the best, as it is white, glossy and strong. The districts of Mymensingh, Dacca and Tipperah grow this jute which is commercially known as "Narayanganj" jute. The districts of Pabna, Bogra, Rangpur and the State of Cooch Bihar are watered by the new Brahmaputra or the Jumna and her tributaries and they grow what is known as Sirajgange jute. Owing to the muddy colour of the water of the Ganges and the greater liability of the jute fields being flooded every year, the quality of the fibre grown in the Gangetic area is much inferior as it is yellowish in colour, less glossy and short in length. The quality of jute of the Purnea District of Bihar is usually inferior owing to the practice of steeping in shallow, muddy ditches or marshes.

The expansion of jute cultivation in Bengal has principally been caused by various economic factors. The average yield of one acre is from 16 to 20 maunds which brings

to the cultivator a net profit of about Rs. 100/- per acre. Hence years of high jute prices are usually followed by expansion in the jute cultivation at the cost of the food crops. In recent years, however, due to the worldwide depression causing a great shrinkage in demand there has been a precipitate fall in the price of raw jute from Rs. 111 per bale of 400 lbs. in 1925 to Rs. 31 in 1932. With a view to reduce the amount of the loss to the cultivator and push up jute prices, the Government have initiated a scheme of voluntary restriction of jute cultivation by which the total output would be reduced by 30 lakhs of bales. The cultivator is being encouraged to grow substitute and alternative crops like sugarcane, tobacco, linseed, groundnut, onion, potato and Aus paddy on the land set free from jute.

After the fibre is ready, it is pressed into bales by hand presses or steam presses for transport. Many exporting firms and Mill Agents maintain hydraulic presses in the different purchasing centres and the jute for export is usually pressed and baled there for direct shipment. The most important market for the purchase of jute is Narainganj which commands the crop of Dacca, Faridpore, Comilla and Noakhali Districts. Next to it is Sirajganj where jute from Northern Bengal, Cooch Bihar and Assam comes in boats. Madaripur serves the Faridpore, Bakerganj and Khulna Districts.

Export Raw Jute is mainly exported to the United Kingdom for the Dundee Mills, to the U. S. A., France, Italy and Spain. Before the war, Germany had a large share in the exports. The export trade met with a set back in 1914 and in 1917, but it rose steadily and in 1928 it amounted to 898,000 tons, but owing to the worldwide slump it fell to 620,000 tons in 1930. The amount exported represents about one-third of the total jute production of India, the remaining two-thirds being used in the weaving of jute in the Bengal Mills.

Jute weaving has long been carried on as a cottage industry, and the coarse cloth which was woven on the hand-

looms was used for the making of bags for the packing of grain. Even to this day, there is a class of people called "Kapalis" in the Dinajpore District who are engaged in this work. The first attempt to convert it into a mill industry was made by George Auckland, who had migrated from Ceylon and with the financial assistance of Babu Biswambhar Sen of Calcutta, he started at Rishra in 1845 a factory for bleaching jute, which did not turn out to be a success. Then he took up the spinning business and in June 1855 started the first machine jute mill of India. In the course of 45 years, the industry has undergone a phenomenal expansion and it covers a wide area between Bansberia thirty-five miles above Calcutta on the Hooghly and Shamgange, twenty-five miles below it. In 1929 there were 98 jute mills with 53,000 looms and 1,146,000 spindles employing a labour force of 343,000 persons, while in 1931-32 there were 103 mills with 61,000 looms and 1,220,000 spindles employing 276,000 labourers. The daily output has gone up from 8 tons in 1855 to 5000 tons today. The concentration of the industry in this locality is due to the availability of the Ganges water, and easy access to the port of Calcutta and to the jute-growing districts of Bengal by the river as well as the land routes, and advantages of being able to secure a steady labour supply from the up country districts as well as the districts of Orissa, Madras and C. P. During the Great War, the Jute Mills undertook to supply the entire Government demand of sand bags and other necessary articles for the Mesopotamian campaign and they made unprecedented profits. The proportion of the export of manufactured jute in 1918-19 was as large as 80.5 per cent., while the percentage of raw jute export was 19.5 per cent. The value of the manufactured jute exported in 1930 was Rs. 42 crores. Indian gunny bags are in demand everywhere for the moving of the crops and the United States, Australia, Chile, Java and Indo-China have a large demand for gunny bags while the United States, Argentine and the United Kingdom are our principal customers for hessian cloth. Between 1930-31 and 1931-32 a marked decline is noticeable in the export of jute manufactures.

jute bags having gone down from 434 millions to 389 million, hessian from 1,238 million yards to 995 million yards and sacking from 32 million to 25 million yards. This is mainly due to fall in demand caused by the trade depression everywhere and partly due to the growing tendency of using paper substitute for jute in packing merchandise and the gradual adoption of bulk handling of grain. "It is estimated that the loss caused to the jute industry in Bengal on account of this change over to paper in the United Kingdom and South Africa alone exceeds 20 million cement bags per annum. The use of hessian for packing dried fruits is also reported to have been largely displaced in Australia by a product known as "Sisal Kraff" consisting of two sheets of brown paper reinforced by sisal fibre." The jute industry in Bengal, therefore, is heading for a crisis.

CHAPTER V

FISHERIES.

In no other Province of India fish is consumed on such a large scale as in Bengal, Bihar and Orissa, though the consumption of fish in the Central Provinces and the United Provinces is gradually increasing. In Bengal about 86 per cent. of the population consumes it daily as fish furnishes the sole proteid element in the dietary of the people which mainly consists of starch and sugar elements. According to a calculation made by Sir K. G. Gupta, the annual fish consuming capacity of the people of Bengal came up to 40 million maunds. The city of Calcutta alone has an annual demand of 10 lakh maunds while the actual supply does not exceed 3 lakh maunds or less than one-third. The average annual per capita supply of fish in Calcutta per annum is about 12 seers while the normal demand is well nigh one maund.

Bengal has enormous resources for fresh water fisheries and these are not excelled in area or potentiality by any other fresh water fisheries outside the United States and Canada. During the dry season the extent of the potential fisheries may be calculated to exceed 8000 square miles while during the rains, when a major portion of the country is under water, the extent of the fisheries is increased by 50 per cent. Various factors are responsible for the lack of proper development of these fisheries. The fishermen are part-time cultivators and are heavily in debt and hopelessly disorganised. They are everywhere in the clutches of the middle-men called *Nikaris* who dominate the trade and dictate terms. The lack of transport facilities stands in the way of the development of fisheries in the out of the way areas resulting in the consequent neglect of some important fishing grounds. Very little seems to have been done to

improve the varieties of fish or to introduce new varieties. The fishery rights in the rivers are usually leased out and the landlord loses any interest in developing the fishery resources. The old methods of fishing by which fish is intensively caught in small areas is destructive in effect as it exhausts the stock of fish in the locality. Agricultural development owing to the increasing pressure of population has resulted in the reclamation of land by filling up the *Jheels* and the consequent reduction in the water area. The expansion of Jute cultivation has exercised a destructive influence on the fisheries as the steeping of jute makes the water injurious for fish. Hence the only hope for the preservation of the fishing industry lies in making it more remunerative than it has been hitherto.

The fishing areas of Bengal may be grouped into (1) the fresh water inland area including the rivers, *jheels* and tanks all over the province, (2) the Estuarine areas extending over the Districts of Khulna, Bakarganj and 24-Perganas, (3) the marine areas.

The principal rivers of Bengal with their innumerable rivulets and tributaries offer enormous possibilities for fresh water fishing. The best varieties of fish, *Rohu*, *Hilsa*, *Katla* are caught in these areas. *Hilsa* fishing is carried on in specially made flat bottomed small boats having wide nets attached to them. This fish moves up the rivers during the rains for the purpose of spawning and it comes back to the sea in winter. River fishing is considerably handicapped by the climatic conditions in Bengal, as the usual breeding time of the fish is the rainy season when the water area expands and the eggs of the carp escape in large numbers into the creeks and paddy fields, where they perish as the water dries up. This serious wastage is likely to reduce the supply of fish in the future.

Fish culture in tanks is very important in localities far away from rivers, but the supply of fish depends to a very large extent on the depth of these tanks, as many of them dry up during summer. The carp fry is annually obtained

From the river for being stocked in the tanks and it grows these at the average rate $\frac{3}{4}$ seers per annum unless it is eaten up by any voracious fish which is usually found in tanks. Crop culture is remunerative as the tank fish commands a higher price in the market than the river fish owing to better quality.

The Estuarian fisheries are mainly in the Sundarbans which possess vast tracts of potential fishery grounds covering an area of about 5,800 square miles, "made up of forest, swamp, estuary, islands and a multitude of rivers, communicating with each other by innumerable small channels." Until now fishing is being carried on mainly in those portions of the Sundarbans which are in the 24-Parghanas and the District of Khulna and the produce is transported to Calcutta from Malta and Khulna. At a conservative estimate these estuarine fisheries are likely to yield 75,000 maunds edible fish per annum while the present supply hardly exceeds one-half of this quantity. Expansion is seriously handicapped by the lack of transport facilities. These fisheries are situated far away from the ordinary traffic routes and the fish has to be brought over long distances to the despatching centres with the result that putrefaction sets in very quickly. The fishing boats are poor in design hence the fishermen dare not go far into the interior of the Sundarbans, and this restricts the extent of the fishing area. These fisheries can be expanded by the provision of better modes of transport and the introduction of improved fishing methods. Trawling will not be possible as the trawls will get embedded in the mud. Light draft steam launches having a length of 80 feet should be employed for the collection of the yield from the various centres and for taking them over to the railhead at Mattla and Khulna. Ice factories should be started at these places for supplying the ice-packing for the fish both during its transport from the fishing centres to the despatching stations and also from there to the points of consumption. The introduction of these launches may gradually assist in pioneering work performed by the Government Trawler "Golden Crown" which has amply

demonstrated that with a fleet of three modern steam trawlers fitted with ice-plants and a number of light steam launches for taking delivery of the catch at the Sandshead the fishery resources of the Bay can be profitably exploited.

The Province of Orissa has important fisheries, both marine and fresh water. The seaboard is about 380 miles long and the potential fishery area of the Bay of Bengal is about 30,000 square miles, which has not been exploited at all while the adequate development of estuarine fisheries has been unimpeded by defective means of communication. The Chilka Lake fisheries are however extensively exploited due to the excellent facilities afforded by the B. N. Railway. The average annual exports of fish by rail from the Province of Orissa amount to about 53,700 maunds and from the Province of Bihar about 42,000 maunds.

It has already been stated that the fish supply of a city like Calcutta is at present inadequate and a large volume of the demand yet remains unsatisfied. A study of the fish supply of the city shows that its supply is borne over nine railways (including light railways), two steamer services, by roads and canals and on country boats. Supplies pour in from Akhaura and Ashuganj on the Brahmaputra in the Tipperah District in the East and Allahabad on the West, Gaibandha and Laheriasarai in the North to the Chilka Lake in the South.

Places at a distance of over 320 miles like Balugaon on the B. N. Railway, Barsoi on the Assam Bihar Section of the E. B. Railway, Rosera on the B. N. W. Railway, Goalando and Chandpur on the E. B. R. and A. B. Railway respectively are regular suppliers of fish to the Calcutta market. Various stations on the E. I. Railway as Allahabad (512 miles), Barh (299 miles), Monghyr (310 miles) send large consignments of fish to Calcutta. Thus it may be said that Calcutta has laid under contribution the entire fishery resources of the whole area which is within a radius of 300 miles around it and with a further improvement in transport, it may yet be possible to extend the area, but a better policy would be to

exploit the present area more intensively so as not to interfere with the growing demand of the other important centres of consumption.

Madras is very favourably situated in respect to her sea fishery and the hardy Madrassi seamen make good catches of Sardines, Mackerel and Cat fishes on the crude catamarans, which are made of logs of wood tied side by side, but the area of their operations is limited as this crude vessel cannot carry further than 5 fathoms from the coast, hence deep sea fishery is almost undeveloped on the Madras Coast. The Madrassi fishermen do large amount of fish curing and they are helped by the Salt Department which supplies salt at low rates duty free. This has increased the market value of their goods and their economic condition has improved. Formerly on the Malabar Coast of the Madras Presidency, Sardines used to be converted into manure by the wasteful process of sundrying on the open beach. Through the efforts of the Madras Department of Fisheries, a simple process for the extraction of the oil has been introduced in which "the fish is boiled in open ironvats, and the resultant mass bagged and put into a hand screw press." The residue is very good manure and is known as "FishGuano." The oil is used in Jute Mills and in candle and soap making and for paints. During the last decade about 270 factories, some large enough to supply steam power, have been started on the West Coast. The guano is used in the tea estates of South India and is also exported to Ceylon, the United Kingdom and Germany. Cochin and Calicut are the main ports of export. The Bombay Coast affords a wide scope for deep sea fishery as her small harbours give good shelter to fishing boats, which are durable and can remain in the sea for days together. The Ratnagiri boatmen are good fishermen and they make good hauls of pomfrets, soles and sea perches. There is ample scope for the development of the canning and curing industry in these parts. The Kutch and Kathiawar Coasts as well as the mouth of the Gulf of Bombay are visited every season by the intrepred fishermen living on the Coast between Surat and Bassein. Large scale enterprise

has already come upon the scene and Messrs. Tata & Co., are manufacturing Sardine Oils and Tinned fish on a large scale at Ernakulam on the West Coast. There are two pearl fisheries in the Gulf of Cutch, one belonging to the Jamnagar State is for true pearl oysters, and the other belonging to the Baroda State is for window-pane oysters. For the promotion of inland fishery, the breeding of small fish has been undertaken by the Government and these are supplied at nominal rates to all, the object being to encourage the middle class people also to take to pisci-culture. The organisation of Co-operative Societies among the fishermen has not only improved their economic condition but has brought them in touch with the technology of curing, canning and oil manufacture.

CHAPTER VI

LIVESTOCK AND THEIR PRODUCTS.

Among the animals which have been domesticated in India, the most useful are the cow and the buffalo, the sheep and the goat, the horse and the camel.

It has already been stated that one of the characteristic features of Indian agriculture is the prevalence of small scale cultivation. The size of the farm is to a large extent determined by the working capacity of the bullock which forms the sole source of mechanical power. The increase in the number of bullocks employed by a farmer depends on their marginal productivity, and regions having stronger bullocks usually have larger sized farms. The working capacity of the bullock is determined by the quantity and quality of the nourishment it receives and as an organism it is governed by the same laws of inheritance as the human being or the plant. Thus sufficient and nutritious food supply and better breeding are the two factors which must be attended to in any scheme for cattle improvement. The cattle, in ordinary years, are left to graze on dried fields in summer, while in famine years heavy cattle mortality is the usual consequence. Under the ever increasing pressure of the population on the soil pasture land is being rapidly utilised for the raising of food crops and very little attention is being paid to the cultivation of fodder crops. Owing to the bulky nature of the fodder, it is not possible to import it from other countries to make up the internal deficiency. Some idea of the actual shortage can be formed by comparing the conditions of fodder supply in India with those in England. In the latter country with its higher productivity three acres are necessary for supporting four heads of cattle, while in the United Provinces not more than two-third acres of less fertile land are available for the grazing of the same number of cattle. The result of this is the marked agricultural inefficiency which is the characteris-

tic feature of Indian agriculture and economic waste due to heavy cattle mortality. The improvement of the supply of fodder is vitally connected with the improvement in the yields of the staple crops of the country as over a large portion of the country, crop residues like the leaves and stems of the grain crops form the main diet of the cattle, hence an expansion in the cultivation of the better varieties of these crops by which the grains as well as the straw may increase in quantity is beneficial both to the man and to the cattle. Any development by which new varieties are grown only for the improvement of the grain content at the cost of the straw will prove prejudicial to the fodder supply of the country. In addition to this in various regions there is ample scope for the growing of leguminous crops and green fodder, which are likely to increase the efficiency of Indian cattle.

In the Punjab, the principal variety of grass is the Chimbari which dies off after the rains, but in irrigated tracts, Shaftal, Berseem and Lucerne can be grown as green fodder as they are capable of yielding several cuttings during the year. In the canal irrigated areas of the United Provinces the cultivation of such leguminous catch crops as Berseem or Shaftal along with cotton is likely to prove successful but in other areas, the success will be scanty as in the early stages of their growth these crops require large quantities of water. The fodder situation in the Central Provinces illustrates the close connection between agricultural efficiency and fodder supply. This region may be divided into the Cotton Belt, the Rice Belt and the Wheat Belt. In the Cotton Belt, owing to the scanty grazing facilities, stall feeding is the prevailing custom and Jowar is cultivated as a fodder crop. Cotton seed furnishes a very nutritious food and the draft cattle is strong and efficient. In the Wheat Belt, the grazing lands are ample, but Kans, a grass of low nutritive value, grows over extensive areas and no fodder crop is raised. The cattle are of low strength and are incapable of pulling heavy ploughs. In the Rice Belt of C. P. and also in Bengal, there is a singular deficiency of green catch crops and muddy straw is the only available

fodder, "which offers a bare subsistence ration for cattle at rest." In the Chattisgarh Division of the Central Provinces, a variety of grass of low nutritive value called *Sukla* or spear grass grows in abundance but this is a short season grass and affords no grazing in June and July when there is a real scarcity of fodder. Hence the cattle breeds of Bengal and the eastern portion of the Central Province are decidedly inferior both for milking and draught purposes.

Rainfall exerts a great influence on cattle breeding as no grass of a good quality can grow in areas of heavy rainfall. The Western Ghats are unsuitable for this reason, and the heavy rainfall, which varies from 80 to 200 inches in Travancore is not conducive to the healthy growth of cattle. In Mysore, Nellore and Coimbatore the upland areas with a moderate rainfall and natural drainage grow extensive stretches of good grass and some of the best cattle breeds of the Deccan are to be found here. Mysore is famous for her Amritmahal breed. The Nellore breed is believed to be the best dairy breed in Deccan. It is a dual purpose animal and the bullocks are very efficient for heavy draught purposes.

Northern Gujrat possesses many natural conditions favourable for breeding. The region round about the Rann of Cutch has an alluvial loamy soil producing grass and various leguminous crops which make excellent cattle food. The Gujrat breed is the finest in India. In Bombay, there are some varieties useful for draught work, *e.g.*, the Kankraj breed is well adapted to the sandy roads of South Gujrat while the small Dangi breed of the Western Ghats works well in the wet rice land as well as in rock regions. In the forest areas of South Kathiawar, are found the Gir cattle well-known for their milking capacity. The uplands of Central India afford ample grazing facilities and there we get the white or grey Malwa cattle which are very useful for agricultural work.

The Punjab has two well-known breeds of cattle, *viz.*, the Hansi or Hariana and the Montgomery breeds. The former breed is to be found in the Eastern Punjab where the

cow has a very high yield of milk. The Montgomery District has extensive pasturages and a scanty rainfall. The extension of the canal system has resulted in the conversion of the grass land into agricultural land but it has made the growing of leguminous crops possible.

Unlike cows, buffaloes thrive in the areas of moderate and heavy rainfall as they require plenty of water for their daily bath. They are useful as milkers as well as for heavy cartage, but nowhere in India is the buffalo serviceable as a dual purpose animal. They are not efficient for ploughing as they are too slow in their movements. They can live on a coarser type of fodder than the cow and are heavy milk yielders. The Murra buffalo of the Punjab has an average yield of 400 lbs. of milk per lactation period while the better types may yield as much as 10,00 lbs. The Rhotak breed is also well-known for the high milk yield. The Kathiawar or Jafarbadi buffaloes are larger in size and the daily yield of milk is between 30 to 40 lbs. The Deccan breeds are more serviceable for heavy cartage but they are poor milkers.

Dairying on a large scale has not yet been developed in India. The Government has several large Dairies which are mainly run on experimental lines. The problem of the milk supply in cities has become very pressing as there is no room for grazing in the heart of congested cities and it is very difficult to arrange for the supply of pure milk from outside, and the result is a serious shortage causing heavy infant mortality. The per capita supply of milk in Bombay is 3 oz. while in the U. S. A. it is 20 oz. and 10 oz. in United Kingdom. The city of Calcutta gets a daily supply of only about 4000 maunds of milk which works out to be about 2.3 oz. per head. Improvement in the supply can take place only when small village dairies can be started in the neighbouring areas and arrangements can be made for the fast transport of the milk to cities. The Co-operative Milk Union in Calcutta has started an organisation by which the milk produced in villages within a radius of 30 miles from Calcutta is collected and pasteurised in their well-equipped factory in Calcutta for sale to the public. This Milk Union

handles about 100 maunds of milk daily and its capacity can be increased considerably by an increase in the number of producing centres. With the assistance of the Railways supplies may be brought down from hitherto untapped sources in refrigerating vans from places situated at a distance of one or two hundred miles. The success of this union has led to the organisation of Milk Unions at Chitagong, Dacca, Shahazadpur, Naogaon, Darjeeling and Dinajpur in Bengal.

Ghee is the most important dairy produce of India and it has a honoured place in the Indian dietary. Most of the *Ghee* which is placed on the market is made out of buffalo butter, which is heated for 8 to 10 hours, so as to remove the moisture by evaporation. The usual tendency is to under-boil the *ghee* rather than over boil it as in the latter process it loses much of its weight. *Ghee* is made in areas where extensive lands are available for pasturage and in fringes of forests where the pressure of population is not great. The U. P., Rajputana, northern districts of Bihar, the C. P. and Madras have a large provincial export trade in *Ghee* while the exports from Kashmir are gradually rising. Sind and Bombay import small quantities of *Ghee* from Turkey and East Africa, while our annual exports to South Africa, Ceylon, Hongkong, Aden and Mauritius are valued at Rs. 25 lakhs. *Ghee* production is localised in areas having superior breeds of cattle, having higher yield of milk with a higher butter content. Systematic adulteration has become a common feature with this *Ghee* and not only harmless vegetable oils as cocoanut, cotton, sesamum are used but such injurious ingredients as Mahua and castor oil or animal fats are not infrequently added.

The severe winter of the Punjab and the North-West have necessitated the wide use of warm clothing in those Provinces while the people of Bengal and South India hardly require any woollen dress even in mid-winter. The poor people still use the less expensive cotton padded coats which are made locally but these cannot be readily cleaned and washed. Those who are better off use woollen coats, great coats, flannels, shawls, wrappers, rugs, etc. Sheep rearing

in India is carried on in areas having moderate rainfall with long stretches of pasture land or in the fringes of forests. The flocks graze all about during the day time and are shut up in the fold at night.

In the Punjab the sheep are reared mainly in the rain-fed tracts. In Bihar and Bengal owing to the shrinking of the pasturage the flocks are sent away to the jungles for grazing during the winter and are brought back to the villages after the *rabi* harvest to feed on the stubble. Very rarely any artificial food is given and no care is taken to ensure good breeding. Sheep rearing is carried on mainly with a view to increase the meat content, while wool is of secondary importance. The sheep of Northern India are better and whiter than those of the Peninsular breed which has a dark colour, but everywhere the wool is short staple, hence it is not suitable for being spun into yarn of higher counts. That and the carelessness in handling the wool for export account for the low price which the Indian wool gets in Europe in comparison to the Australian wool. The per capita yield of Indian wool is only 2 lbs. per sheep while the Australian yield is $7\frac{1}{2}$ lbs. The total production of wool in India is about 60 million lbs. per year. The main centres of production and trade in raw wool are in the Sub-Himalayan region, Garhwal, Almora and Naini Tal in the U. P. and Hissar District in the Punjab and in the Deccan tableland, in the Khandesh District of Bombay, and Bellary, Kurnool and Coimbatore districts of Madras, while the Bikaner and Mysore States have a large supply of wool. In addition to her local supply, India has a large import trade of wool across the frontier and also from Australia and Persia. Wool from Afganistan and Central India, white and black in colour, is collected at Quetta and Shikarpur on the North-West Frontier and at Amritsar and Multan in the Punjab. A superior type of Shawl wool called *Pashm* comes from Tibet and is collected at Kalimpong near Darjeeling and Tanakpore in the U. P. The Persian wool forms about 70 per cent. of the sea-borne imports of wool, while the Australian merino wool is imported for high class work. The

exports are mainly destined for Afghanistan and the United Kingdom and their decline is an encouraging indication of the growth of the wool manufacturing industry in India.

Blanket weaving is even now carried on everywhere as a cottage industry but some mills have specialised in this work. Kashmir and Amritsar are well-known for the embroidered shawls made there from the Tibetan wool, but of late years, machine-made worsted yarn is being imported in large quantities for shawl-making. India has now 12 woollen mills of which six are in the U. P., and one in Mysore State. These Mills have a capital of Rs. 2½ crores and employ 8,300 persons and the weight of goods produced by them in 1921 was 3,820,000 lbs. These mills are suitably situated in respect of the market for raw wool as the Cawn-pore and Dhariwal Mills get easily the supply from Kangra, Kumaon, Nepal and Eastern Punjab; the Bombay Mills get it from the Khandesh and other Deccan districts and the Bangalore mill gets its supply from the Mysore State itself. Besides these mills there are many large sized weaving establishments in the Punjab each employing more than 5000 hands per year, engaged in the production of shawls, chadars, Pashmina and Jamawar. Next to these in popularity are the white Rampuri Chaddars made of Pashm warp and silk weft, occasionally with embroidered borders. This industry is soweever gradually declining.

The use of shoes is more common in North India than in the South and there is a marked difference in the patterns of indigenous shoes worn in the North and South. Besides this, hides and skins are used in the manufacture of saddlery, bags, suit cases, upholstery leather for cushions and sofas, book binding leather, water buckets for irrigation and various kinds of musical instruments like the *Dugi*, *Tabla*, *Khole* and *Mridanga*. It has been aptly remarked that "although the tanner's trade is not so spectacular as ammunition making, leather is as much indispensable for the army as powder and shell." Its uses in peace as well as in war are manifold and India has immense resources in her hides

and skins. "Hides" technically refer to the raw, dressed or tanned skins of bullocks, cow and buffaloes and "Skin" refers to the skin of calves, sheep and goats.

The extent of the industry depends on the availability of hides and skins and the breed of animals on the one hand and on the supply of raw materials for tanning on the other. In India, there are several superior breeds of cattle of which the Hansi-Hissar of the Punjab, the Nellore of Madras, the Nagora, the Amrit Mahal of Mysore, Gir cattle of North Gujrat are the best their hides have been found to produce good leather. Cattle rearing is primarily done for the milk or for draught work and not so much for the meat or the hide, hence the quality of hide does not tend to improve. The availability of fodder and good pasturage are very important factors in determining the breed of cattle and the supply of hides. The river deltas are not good centres for the supply of hides as in these areas the breed of cattle is very poor and the straw which is the principal fodder, has very little nutritive value. The quality of grass is very good in Peninsular India where the rainfall does not exceed 40 inches and pasturage all round the year is available. In the Sub-Himalayan regions though the grass is not of very good quality there is ample scope for grazing in the fringe of forests hence these regions have a plentiful supply of hides. Goat skins are mainly supplied by Eastern Bengal and lizard skins come from the Eastern Ghats and the barren tracts in the Punjab.

The preliminary work of the collection of hides is entrusted to the village *chamar* who flays the skin and his careless method of flaying and the cruel practice of branding the cattle are mainly responsible for the low prices which Indian hides fetch in the foreign markets. The hides are cured by wet salting, dry salting or by arsenication. In dry salting, sodium sulphate or Khari is usually applied. The better varieties are air dried by stretching them on frames after which they are treated with Arsenic. The dealers in hides are Mahommedans or low caste Hindus and they are the collecting agents for the factories in India as well as for the exporting houses.

Tanning in India was principally carried on by the process of vegetable tanning before the introduction of the chrome process. There is an abundant supply of a large variety of tanstuff such as Acacia pods and bark, Indian Sumach, Mangrove, Myrobalam and Dividivi, etc., and these are mostly found in the forests of Central India, Nepal, Terai, Chota Nagpur and the Eastern Ghats, thus within easy reach of the tannery centres of North and South India. Vegetable tanning takes a long time, four weeks in the case of skins and six months for ox and buffalo hides. The availability of tanstuffs in the Madras and Bombay Presidencies has given rise to about 500 tanneries of all sizes employing 16,000 labourers. In some of the best tanneries of this type, high grade leather, called "East India kips" is produced for export to England and U. S. A. The introduction of chrome tanning in 1884 revolutionised the leather industry, especially in the making of boot and shoe upper leathers. The actual tanning agent is a basic salt of Chromium and the time taken does not exceed 4 weeks, all the processes being performed with the aid of machinery. Chrome tanning has been developed considerably in Madras, Calcutta and Cawnpore.

Sixty years ago the export trade in raw hides was negligible but the development of bark tanning in Madras led to export of semi-tanned hide to England, but from 1890 onwards the swing of the pendulum was towards the Continent and Germany became the chief customer of Indian hides. With the outbreak of war, the export of raw hides ceased but the Government of India gave a great impetus in 1916 to the Tanning and Boot making Industry by giving huge orders for boots for the Army. This made the position of the group of Cawnpore Tanneries secure and in 1919 an export duty of 15 per cent. on raw hides sent outside the British Empire was levied which aimed at keeping the hides within the empire. The exports in hides and skins in 1926 amounted in value to Rs. 14.50 lakhs but owing to trade depression it fell to Rs. 9.92 lakhs in 1933-34. The United Kingdom, Italy and U. S. A. are the principal customers of raw hides and skins, and in the last named country there is

a great demand for lizard skins for the making of ladies shoes. The annual export of these skins is about $3\frac{1}{2}$ millions representing a gross value of £350,000.

Indigenous shoes of various designs are made at Jaipur, Delhi, Peshwar, Agra, and each of these cities has its own peculiar style and finish. These shoes are often elaborately embroidered and even jewelled. Embroidery in gold and silver thread both genuine and imitation, is applied not only to the upper portion but in some cases to the inside of the shoes and slippers.

Modern methods of tanning have been adopted in Bangalore, Agra, Gwalior, Calcutta, Cuttack, Madras; Mysore; Cawnpore and in the latter place there are a number of big tanneries. Very recently the world famous firm of Bata Co. have opened a large Tannery at Konnagore near Calcutta. Tanning at Cawnpore began in 1890 with the establishment of the Government Harness and Saddlery Factory followed by the tanneries of Messrs. Cooper Allen & Co. Cawnpore, is an ideal centre of tanning as the supply of hides from the Terai districts is abundant and owing to the facility of railway communication transuffs from the forests of Central India can be transported without any difficulty.

Silk cloth is considered by the Hindus as very sacred, a cloth which he puts on, when he goes to the temple or when he performs Pujas. There are mainly three varieties of silk to be found in India—the Tasar, the Muga and Eri. The Tasar affords the best material for making *Dhoties* and *Saries*. The silkworm lives on Mahua, Sal, Asan, Ber and Kusum trees and it is found in the lower ranges of the Himalayas and in the jungles of the central tableland of the Deccan and Chota Nagpur. Muga is reared on laurel leaves in Upper Assam and Nilgiri Hills and in Kashmir where the mulberry trees are cultivated on the bush system. The Eri feeds on castor leaves and as the worms are more hardy and less susceptible to disease, they can be grown all over the plains as a cottage industry. Mulberry silk is deep yellow in colour while the Eri is whitish and Muga is glossy yellow.

There is ample scope for the expansion of silk rearing in India. Silk worms grow well in a temperature between 65 and 75 F., which means that they can be reared all over India in some season or other. In some places in Bengal, Bihar, the U. P. and in the sea coast districts of Madras it can be grow all round the year except in mid summer. The trees on which they live are to be found in all zones of climate and in all soils.

There is great division of labour in this industry. Mulberry or Eri cultivation is carried on by the agriculturists and there are two methods of planting mulberry:—(1) the Bengal system of growing bushes, (2) the High system of plantation which helps the mulberry to grow as a medium sized tree yielding leaves three times in a year. The cocoons are reared by the hill tribes in the jungles of Sonthal Parganas and Orissa States in Bihar and Orissa, of Assam and of Mysore while in several places the rearing is done in the villages by people who in many cases also do the spinning. The centres of weaving are in most cases far away from the rearing area, and the cocoons are collected by the *Beparis* and sold to the weavers. The weaving centres in Bengal are Murshidabad, Jehanabad, Midnapore, and Birbhum while Bankura produces *Kezhi* cloth which is made from pierced cocoons. In Bihar and Orissa in the districts of Sambalpur and Singhbhum, silk is woven from locally produced cocoons, and Bhagalpur buys its raw material from the Sonthal Parganas and the districts of Hazaribagh and Palamau and manufactures the well-known Bafta silk. In Assam the centres of industry are Sibsagar, Golaghat and Jorhat. The Punjab has a flourishing industry at Ludhiana, but there is a greater demand for Madras silks all over India. Gold brocade work is still carried on at Agra, Baroda and Surat. The Benares industry has been rescued from certain ruin by introducing weaving with imported yarn. Formerly the weavers used to market the goods themselves but now they have lost this independence and the work of marketing has been taken over by the *Mahajans* with the result that many of the old artistic designs and patterns have disappeared and

while the article has become cheaper, it has suffered in the loss of variety. Silk brocades are also made at Multan and Bahawalpur. Cocanada and Ganjam in Orissa make *saris* and suiting with mixed silk and cotton. The silk *saris* of Kathiawar with artistic embroidery is famous all over the country, while the striped silks made at Amritsar, Azamgarh, Mirzapur, Karachi, Surat, Tanjore, Chingleput and Madura are in great demand. In Burma, silk is used by the rich and the poor and there is a large silk weaving industry in the Mandalay district but the quality of silk is not very good. The Government is trying to develop silk rearing as a cottage industry and has started central nurseries for the supply of seeds at Berhampore in Bengal and Nathnagar in Bihar. Mysore and Kashmir are also giving considerable assistance to the industry.

Formerly India had a large export trade in manufactured silk, but this has gradually declined. There are six mills in India, two in Bombay and one in Calcutta, Ahmedabad, Bangalore and Benares and the output of these mills along with the silk woven on the hand looms is almost entirely consumed within the country. Imports of silk yarn from Japan, Italy, China and France have increased considerably as they are cheaper and the colour is more attractive. The export of raw and manufactured silk has also risen from Rs. 3,18,000 in value in 1932 to Rs. 3,29,000 in 1933 and the exports go to the United Kingdom and France while there is some trade with Natal and Northern Africa. Imports of raw and manufactured silk have declined in value, being Rs. 3.59 lakhs in 1933 as against Rs. 4.33 lakhs in 1932, the principal sources being China and Japan. The same decline is also noticeable in the case of trade in artificial silk piece-goods and yarn and the share of Italy, the largest supplier, was reduced from 506 million lbs. to 403 million lbs. in 1933-34 while Japan increased her exports from 108 million lbs. to 205 million lbs. Although the United Kingdom continued to hold her position, imports from Germany and France have increased considerably in recent years.

CHAPTER VII

THE MINERAL RESOURCES OF INDIA.

India has been endowed with vast and varied mineral resources. The fullest use of her extensive mineral wealth has not yet been made and large deposits of minerals yet remain unexplored. Coal, Iron, Mica, Manganese, Gold, Salt, Saltpetre, Petroleum, Copper, Tin and Bauxite abound in various parts of India and deposits of many of these minerals are awaiting the magic touch of the capitalist to fulfill their destiny.

Minerals in India are very unequally distributed, Northern India has a larger share than the southern portion of the Continent. An important mineral like coal occurs in one lump in one corner of India while the supply of coal-fuel in the other parts is consequently defective. In between the gap of the Vindhya and the Eastern Ghats and in the extremities of these two ranges occur large deposits of coal and iron, copper and manganese with the occurrence of gold and iron in the gap between the lower extremity of the Eastern Ghats and the Annamalais. The North-east and North-west frontier districts have pockets of petroleum, while the vast alluvial plain of Northern India is practically devoid of any minerals excepting the Salt ranges in the Punjab and occasional deposits of Kaolin in various parts. The total value of mineral production in India exceeded £16½ millions in 1933 out of which coal accounted for 27.7 per cent., Petroleum 28.3 per cent., Manganese 0.6 per cent., Gold 12.2 per cent. and Lead about 4.8 per cent. each, and Mica 1.75 per cent.

Coal is therefore our most important mineral and its existence was known to Hindus in ancient India but owing to the extensive supply of timber it was never used for domestic or industrial purposes. In 1777 two servants of the

East India Company, Farquhar and Motte obtained permission to bore holes for the purpose of mining coal in the district of Jharia, but the actual working on a large scale did not begin earlier than 1893.

Coal is found in the Asansole sub-division of Burdwan, in the Giridih sub-division of Hazaribagh, in Manbhum and Palamau districts of Bihar and Orissa, in Singareni in Hyderabad State, in Wardha and Pench Valley in the Central Province, Umaria in Rewah State, and Makum in Assam and in the Jhelum district of the Punjab. The Coal-fields of Bihar and Orissa contribute about 68 per cent. of the total annual production of India, and of this, Jharia produces alone about 42 per cent. The early development of Ranigunj and Jharia fields is chiefly due to their accessibility owing to the railway connection and the superior quality of the coal. The coal found in Bokaro, Karanpura and Barakar fields is inferior in quality. The Giridih and Ajai valley coal-fields are being rapidly worked up. The Talcher coal-fields in Orissa is being rapidly developed, the output amounted to 253,586 tons in 1932.

The Ranigunj field in Burdwan district has an area of 500 square miles and the seams occur at various depths up to 3,000 feet below the surface. The Jharia field became really productive when the E. I. Railway constructed a Railway line connecting Dhanbad and Barakar in 1894 and the laying out of the B. N. Railway connection increased the output by about tenfold. The Jharia field has an area of about 150 square miles and here as many as 18 seams of coal varying from a few feet to 100 feet in thickness, have been found. Due to the low moisture content of this coal; it is particularly suitable for the manufacture of hard coke for metallurgical purposes. In 1934 the output of coal from Jharia was 9 million tons, out of which about 1.3 million tons of coal were used for the manufacture of hard coke. Close to the Jharia field lies the Bokaro field with an area of 220 square miles. The extensive coal-fields of North and South Karanpura lie at the foot of the southern scrap of the Hazaribagh tableland. In 1934 the output of this

field was 400,000 tons. The Giridih field is very small in area but is very valuable as it produces one of the best steam and coking coals in India. The principal seam that has been worked so far is known as the Karharbari lower, with an average thickness of 15 feet. The output in 1934 amounted to 7,61,000 tons.

CONSUMPTION OF COAL.

| | | 1923. Per cent. | 1932. Per cent. |
|-----------------------------|----|--------------------|--------------------|
| I. RAILWAYS | .. | 30.8 | 32.7 |
| II. R. INDIAN MARINE | .. | 0.2 | 0.2 |
| III. BUNKER COAL | .. | 4.6 | 5.5 |
| IV. COTTON MILL | .. | 5.6 | 6.9 |
| V. JUTE MILL | .. | 4.7 | 3.3 |
| VI. IRON INDUSTRY | .. | 12.0 | 20.3 |
| VII. PORT TRUST | .. | 0.1 | 0.4 |
| VIII. INLAND STEAMER | .. | 2.9 | 3.0 |
| IX. BRICK KILN | .. | 2.2 | 3.4 |
| X. TEA GARDEN | .. | 1.0 | 1.0 |
| XI. PAPER MILL | .. | 0.7 | 1.0 |
| XII. COLLIERIES AND WASTAGE | | 12.3 | 10.2 |
| XIII. DOMESTIC CONSUMPTION | | 22.5 | 12.1 |

The coal-fields in the Central Provinces have not yet been properly worked owing to the lack of proper railway connections, the Ballarpur colliery having an output exceeding 217,421 tons per annum. The coal in the oldest coal-field in Central Province the Mohpani, is liable to spontaneous combustion and the annual output is well over 813,817 tons from the Pench Valley field.

Outside the Gondwana coal-field in Chota Nagpur and Bengal coal of tertiary age occurs in the Lakhimpur and Sib-sagar districts and Makum in Assam, and in the Bhamo, Henzada, Mergui districts and Shan States and at Khost, and Quetta Pishen in Baluchistan, and at Dandol in the Jhelum

district and Mianwali of the Punjab. Makum coal is used by the Assam Bengal Railways and the steamers plying in the Brahmaputra, while the Khost colliery is worked by the North-Western Railway.

Coal mining engages about 220,000 labourers in India. These labourers are recruited in the Jharia fields from the aboriginal tribes of Chota Nagpur, from the Central Provinces and the Northern districts of Madras, but they go back to their villages during the agricultural season, hence labour supply is inadequate and uncertain. This has stood in the way of the development of a mining class and accounts for the comparatively low efficiency of the Indian miner. The following table gives a comparative estimate of the output per head of coal :—

| Country. | Above and below ground per head. | Below ground per head. | Year. |
|--------------|-------------------------------------|---------------------------|-------|
| U. S. A. . . | 694 tons. | <i>Nil</i> | 1925 |
| U. K. . . | 221 „ | 277 | 1925 |
| Japan . . | 722 „ | 168 | 1925 |
| India . . | 111 „ | 173 | 1925 |

But it is a hopeful thing to find that there is a steady improvement in the efficiency of the Indian miner, in as much as his output above and below ground has risen in 5 years from 94 tons in 1922 to 113 tons in 1926. Recent legislation has prohibited the employment of women in underground work and this when properly enforced will certainly *push up the labour cost*, but this has already stimulated the use of electricity in the Indian mines for pumping and coal-cutting, while central generating stations supply power to groups of collieries.

About 30 per cent. of the total consumption is contributed by the railways, while the iron industries consume about 12 per cent., domestic consumption accounts for 22.5 per cent. and Bunker coal is 4.6 per cent. Efforts are

being made to increase the proportion of coal in domestic use as this will prevent the burning of cowdung cakes as fuel but this can only be done with a reduction of the freight on coal.

Imports of coal began to increase in the post-war period owing to the drop in the home production of 1920 and 1921. The imports in 1922 amounted to 1,220,639 tons out of which 742,000 tons or about 33 per cent. came from the United Kingdom, 236,000 tons from South Africa, 157,122 from Portuguese East Africa, 55,000 tons from Japan, and only 17,000 tons from Australia. These imports are principally due to the higher calorific value and low cost of transport of foreign coal, while the Railways are responsible for a large share of imports. Since 1921 about 11 per cent. of the coal used by railways is foreign. In recent years, the imports have fallen. Coal valued at Rs. 62,49,000 was imported in 1927 while the value of the imports in 1934 was only Rs. 12,50,000.

The exports of Indian coal have gone down considerably. The value of coal exported in 1917 was Rs. 76,43,000 and in 1934 was Rs. 29,22,000. The decline began in 1918 when owing to shipping difficulties, the Government restricted the exports. The principal customers were Ceylon, Strait Settlements and Dutch East Indies in addition to shipments of bunker coal from Calcutta and Bombay. Australian and African coal has successfully kept out the Indian coal from these markets and it will be difficult for India to regain them or successfully to withstand the intrusion of foreign coal until the cost of coal at the pithead is reduced and the quality is improved. Our exports of coal to Ceylon, one of our principal customers, have gone down by 84,000 tons in 1931 and during this period the imports of Ceylon from the U. K. rose from 6,165 to 243,857 tons.

From this state of things, it is easy to infer that the coal industry is having a bad time and many of the smaller collieries have been compelled to close down. Railway freights, it has been urged, are principally responsible for

this, while the paucity of railway waggons has aggravated it. The freight on one ton of coal from Natal to Bombay is lower than the freight on one ton from Jharia to Bombay. The restrictions on the supply of waggons has given an impetus to the bigger collieries to introduce electrically worked appliances for cutting coal which means the death knell of small companies.

The future of the coal industry lies in the reduction of the cost of coal at the pithead, and an increase in production by the employment of mechanical appliances and avoidance of wastage by leading it direct to railway trucks. In order to secure the proper price for the coal, a Coal Grading Board has been constituted which will supervise the grading of coal according to well defined standards so as to secure a reputation for quality in the overseas market. The rebate on the export of coal has been doubled with a view to develop the exports and an increase in the number of waggons has been made to facilitate the transport of coal.

IRON.

Next to coal, the most important gift of Nature is Iron. Though the usefulness of the metal is undisputed, yet the industry connected with its raising and manufacture has been started within recent times. Iron smelting and steel-making used to be carried on according to indigenous methods in India by the Lohar caste, who used wood-fuel for smelting purposes, but the cutting down of forests and the import of cheap iron and steel implements have resulted in crippling this industry and the Lohars have turned into agriculturists. Even now some places have kept up their excellence in the manufacture of several articles made of iron or steel. Hyderabad is still famous for its swords and daggers and it is said that it used in former times to furnish the material out of which the famous Damascus blades used to be made. Baroda is famous for wrought iron railings, while the engraving and carving of iron and steel flourished in Madura, Vizagapatam, Mysore, Monghyr, Jaipur and Jodhpur.

Iron came into use quite early in India in times of peace and war. The ploughshare was made of iron, and iron buckets were in wide use. Arrowheads, swords and spears were made of this metal and its use in the art of medicine was no less important. There was thus a wide demand for iron goods and iron smelting was certainly an extensive industry, localized in the alluvial plains watered by the Indus, Ganges and Brahmaputra. The friable portion of quartz iron ore schist or deposit of ferruginous laterites which are scattered all over this region were used by all the smelters. Iron ore in the form of haematite and magnetite mixed with the quartz occurs in many tracts of Deccan Peninsula and these have assisted in the development metallurgical industries in Hyderabad and Mysore.

In modern times, India requires Iron and Steel for the development of her industries, for transportation, for the proper utilisation of her raw materials as well as manufacturing efficient machines of offence and defence and above all to maintain, "this steelshod, steel armed and steel armoured type of civilisation."

The iron industry in India is still in its infancy, and she has to depend on foreign countries for iron goods and machinery. The following table gives an estimate of the imports of iron and steel materials into India from 1919 to 1923 :—

| | 1919 Rs. | 1921 Rs. | 1923 Rs. |
|---------------------------------------|---------------------|---------------------|---------------------|
| Cutlery and Hard- ware .. | 5,69,62,350 | 8,46,17,142 | 5,19,99,881 |
| Machinery .. | 9,29,62,270 | 34,99,59,458 | 21,79,23,239 |
| Railway Plant and Rolling Stock .. | 7,21,71,680 | 22,74,09,591 | 12,70,09,736 |
| Iron Bars and Pig Iron .. | 56,97,390 | 71,56,836 | 37,94,513 |
| Iron and Steel Beams, etc. .. | 13,26,60,380 | 19,86,63,063 | 1,44,68,187 |
| Steel Bars, Angles, etc. .. | 2,26,70,560 | 4,16,45,731 | 3,13,60,486 |
| TOTAL .. | 38,31,24,630 | 90,94,51,821 | 57,67,69,642 |

It is not possible at this stage of the development of the Indian steel industry to produce machinery, higher grade of cutlery, high grade steel and rolling-stock, but there is ample scope for the expansion of the manufacture of pig iron, iron bars, iron and steel beams, etc. In 1922 omitting Iron and Steel parts in locomotives and rolling-stock the imports amounted to 10,00,000 tons and the production of Iron and Steel in India was in the neighbourhood of 4,00,000 tons, but out of this only 2,50,000 tons were available for internal consumption. Thus "the total Indian consumption of Iron and Steel may thus be put at a little over 1½ million tons." (E. H. Solomon, *Protection for Indian Steel*, page 10).

LOCATION OF IRON ORES.

The principal type of Iron ore most useful from the economic point of view is the Haematite, which occurs in what is known as the Iron-belt, which extends from Garumahisani in Mayurbhanj state in Orissa through Koenjhar and Bonai states to the Kolhan sub-division of the Singhbhum district of the province of Bihar and Orissa. The most valuable deposit occurs in the chain of hills extending over 30 miles from Kompilai in the Bonai state to the neighbourhood of Gua in the Singhbhum district, as in this area we get about 60 per cent. of the total deposit of this Belt. The ore occurs in most places near the hill-tops, which are about 1,500 feet above the level of the plain, but in many portions in the Koenjhar state they are to be found at very great depths. The estimated quantity of deposits in this Belt exceeds 2,832,000,000 tons, and about 33 per cent. of this is to be found in the Singhbhum district alone. The haematites have a high iron content with a low percentage of sulphur and have thus a high commercial value. The Mayurbhanj deposits occur mainly in the Garumahisani, Okampad (Sulaipet) and Badampahar hills. It is estimated that Garumahisani alone has a deposit exceeding 10,000,000 tons of ore.

Iron ore occurs in Lohara and Pipalgaon in the Chanda district and in Rajhara in the Drug district of the Central

Provinces. The iron content of these ores is fairly high, varying from 61 to 67 per cent. and the deposit has been estimated to exceed 10 million tons, but this C. P. Iron Belt has not been properly tapped owing to the lack of coking coal, though limestone and manganese deposits in the neighbourhood are quite adequate and there is ample scope for the development of an industry engaged in the manufacture of ferro-manganese.

Iron ore in the form of mixed haematite and magnetite occurs in the Bababudan hills and in various Taluks of the Shimoga district of Mysore. The deposits have a high iron content and are more than 50 million tons in quantity.

Deposits occur in other parts of India, *e.g.* at Ramgarh and Dechauri in Kumaun and in the Salem district of Madras, but these have not been commercially utilised on a large scale. The Salem deposits of Magnetite are very extensive and they occur at Godamalai, Singapatti, Tirthamalai and Kaujawalar. The total quantity of ore available is considered to be practically inexhaustible, but owing to the scarcity of fuel it has not been possible to work them on a large scale.

GEOGRAPHICAL ASPECTS OF IRON SMELTING.

The main materials required for smelting are coal and limestone and dolomite. Coal is used as an agent for removing the oxygen from the ore and also as fuel. Limestone is a good flux and it removes the impurities in the ore in the form of slag. Coal is used in the form of coke which is made by burning crushed coal in coke ovens. Pig iron is made in blast furnaces, which are tall structures made of fire-bricks. Into these furnaces are poured the iron ore, coke, limestone and dolomite and blasts of hot air are sent into them to burn the materials and to produce the pig iron, while the impurities go out in the form of molten slag. Therefore iron smelting can flourish in places where the raw materials are found in close proximity to one another and success depends very largely on the economical assembling

of these materials. The Iron Belt of Chota Nagpur and Orissa has an advantageous geographical situation, as the coal-fields of Manbhum are within a distance of 150 miles. There is, however, one disadvantage, *viz.*, that the limestone and dolomite of the best quality are far away from this Belt at distances over 250 miles away. This disadvantage has not stood in the path of the development of the Iron smelting industry in this Belt as inferior varieties of limestone from Raj Gangpur and Badarpur and dolomites from Usra in Gangpur State are being used. Indian coking coal does not compare favourably with that found in England owing to the existence of a higher percentage of phosphorous and ash, but owing to the low cost of transport due to the proximity of the coal-fields to the smelting centres, it is not a very formidable obstacle.

The qualities of coking coal available in this area are quite adequate to the growing demands of the Iron smelting industry. According to the eminent geologist, Dr. Pascoe. "It is safe to conclude that, assuming 3 tons of coking coal are necessary to produce 2½ tons of coke there is enough coking coal in India to supply the Iron and steel industry with 4 million tons of metallurgical coke per annum for the next 150 years at least."

Another centre for development of Iron smelting is Western Mysore where, as has been stated before, large deposits of iron ore occur in the Bababudan hills. A serious obstacle in the way of the development of this industry was the lack of coking coal, but it has been surmounted by smelting the ore with the aid of charcoal obtained by distillation of wood from the extensive forest areas of the Shimoga and Kadur districts.

Lack of fuel has stood in the way of the utilisation of the Salem deposits in Madras. The nearest coalfield is far away in Hyderabad state and the quality of the coal is not very suitable for the purpose of its being used as coke. Owing to the great distance of these ore deposits to the Bengal coalfields, and the relatively high cost of railway

transport, it is not a practical proposition to remove either coal to the iron area or the iron ore to the coalfields. In the U. S. A. the best coke is made in Western Pennsylvania but the main deposits of Iron ore are near Lake Superior at a distance of 1000 miles, but there the cost of moving this ore is not high owing to cheap water transport facilities available in the Great Lakes region.

MAKING OF STEEL.

Two methods have been adopted in India for making steel. The first is the Open Hearth system. These furnaces are made of fire-brick, silica and magnesite-brick and into these are placed the pig iron along with small quantities of lime for the removal of all the impurities. The purified product emerges in the form of steel. The second method is the Duplex process by which the molten pig iron is poured into a Bessemer Converter where the heat is maintained by blasts of air. The molten steel is then cast into ingots or blocks weighing 3 tons each, which in their turn are passed through the Rolling, Blooming and Bar mills according to the final form they are to assume. Indian Steel factories make heavy rails, light rails, fish plates, bars, plates, sheets, sheet-bars and blooms. In the course of conversion of pig iron into finished steel, a certain amount of unavoidable wastage takes place, thus "for each ton of pig iron produced, the approximate consumption of iron ore is $1\frac{1}{2}$ tons and of coking coal $1\frac{2}{3}$ tons. Similarly for each ton of finished steel, nearly 2 tons of iron ore and about $1\frac{5}{6}$ tons of coking coal are used" (Report of the Tariff Board on Steel Industry 1924).

GEOGRAPHICAL FACTORS IN STEEL MAKING.

The principal centre for the manufacture of steel in India is Jamshedpur. The most economic method of making steel is to convert the pig iron direct into steel, hence the smelting operations and steel manufacture are usually performed in close proximity to one another. This is actually being done by the Tata Iron and Steel Industry at Jamshed-

pur, which is well situated from the geographical point of view for being the centre of steel making in Northern India. The deposits of Iron ore at Garumahisani are only 50 miles away and coal has to be brought from a distance of 100 miles, while within the same distance lime-stone and dolomite are found. The cost of transportation of raw materials is moderate. In the case of iron ore it is $7\frac{1}{2}$ annas per ton and for coal it is Re. 1-5-6. Unskilled labour is available in large number at comparatively low wages from the Bilaspur and Chattisgarh districts of the C. P., and from Chota Nagpur and Orissa as Jamshedpur is on the main line to Nagpur and is connected with Orissa and Chota Nagpur *via* Kharagpur and Adra respectively. The Subarnarekha river supplies the water requirements of the industry though it has no utility from the point of view of transportation. The market for steel in India is already extensive and with the progressive industrialisation of the country and the expansion of transport facilities the demand is certain to develop rapidly. The Tata Iron and Steel Industry has been able to attract a very large capital and with the credit they have been able to establish in the country, they will never be lacking in financial assistance so as to enable them to produce steel economically. The Government of India on the recommendation of the Tariff Board have extended to them protection from time to time in the shape of heavy protective duties and bounties. The output of the Tata Company in 1927-8 was 429,000 tons which supplied 30 per cent. of the demand for the same class of goods. In spite of the severe economic depression the output was kept up at 427,000 tons in 1932-33 and its share of the market rose to 72 per cent.

A prominent feature of the Steel Industry in India is the integration of all the processes of manufacture under the same firm. The Tata Company owns iron mines, coal mines, coke ovens, blast furnaces, lime-stone quarries while it has its Bar Mills, Rail Mills, Sheet Mills as well as the By-product plant for the manufacture of Ammonium Sulphate. The same tendency is noticeable in the other centre of Iron Industry, in the area round Asansole, where are congregated

the Indian Iron Steel Company at Burnpore, the Bengal Iron & Steel Company at Kulti and the Kirtyananda Iron Factory at Sitarampur, all within a radius of 20 miles around Asansole. The Bengal Iron and Steel Company began its operations as early as 1889 and it owns its iron mines in the Kolhan Estate, Singhbhum and in Ghatsila in Dhalbhum, while its coal mines at Ramnagar are only 2 miles off from the factory. Thus at this centre the iron ore is brought from a distance to the colliery, and the Indian Iron & Steel Company at Burnpore receives its iron ore from its mines at Gua in Singhbhum and lime-stone from its quarries at Guttianagar. This factory makes not only pig iron but has integrated along with it the utilisation of the waste products, *viz.*, coal tar products and Sulphate of Ammonia. In the case of both these firms, the railway communication of their factories with their Iron Mines is quite adequate and is supplemented by rope-ways which connect the mines with the railhead.

LOCALISATION.

The development of the Steel Industry at Jamshedpur has given rise to a number of industries round about the place which use partly finished steel for their manufactures. These subsidiary industries get all the advantages of geographical situation as the central industry and in addition to it get the raw material close at hand and in many cases receive financial assistance and favourable rates from the parent firm. Thus Jamshedpur is fast developing into a great industrial centre. Among the industries which have sprung up there the most important is the Tinsplate Industry, which is engaged in making tins for the transport of kerosine and petrol, for packing cigarettes and biscuits. This factory has been financed jointly by the Burma Oil Company and the Tata Company and it is under a contract by which its product is purchased wholesale by the former while another contract with Tata ensures its supply of Steel bars from the Tata Company. Another industry dependent on the Tata Company for its raw material is the Indian

Steel Wire Products, Limited, which purchases its requirements of steel rod from them and has undertaken the manufacture of barbed wire and galvanised wire as well as of ordinary wire and wire nails. The Agricultural Implements Company of Jamshedpore derives its steel from Tata Company and manufactures picks, spades and hoes. There is an immense market for the products of this firm. The Peninsular Locomotive Company has been started at Jamshedpore for the manufacture of locomotives from Tata Steel. The future prosperity of the Steel Industry depends to a large extent on the success of this firm. This industry is favourably situated as about 50 per cent. of its raw materials can be supplied by Tata and other Steel Factories while skilled labour trained in Engineering firms and Railway workshops is not wanting. The Tata Company is fostering the Steel Enamelling Industry by making a five years' contract with the Enamelled Iron-ware Limited of Jamshedpore. The present centre of this Enamelling Industry is in Calcutta where there are three factories engaged in this industry. These factories import their steel sheets and materials for glaze from foreign countries through the Calcutta port and their produce is distributed to other parts of the country from Calcutta.

MICA.

From very ancient times Mica has been in use in India in medicinal preparations but its industrial importance has come into prominence in recent times. Sheet Mica is now used in furnace windows, as chimneys of gas lamps while it is utilised in the electrical industry as insulation for separating the copper pieces of the commutators and commutator cores and rings and also for separating the plates and leaves of electrical condensers. It is being gradually used more and more with the greater development of high voltage currents, where nothing but Mica can be satisfactorily used as an insulation. With the rapid expansion of the use of electricity in India, both for the purpose of illumination and power, the demand for Mica will increase by leaps and

bounds. During the War, mica was in great demand for wireless telegraphy, aeronautics, and motor transport. About 86 per cent. of the mica consumption of U. S. A. is in the electrical industry where it is used as the commutators of dynamos and motors, condensers of magnetos and wireless apparatus, in fuse boxes, lamp sockets, telephones and phonograph discs, etc. In addition to this, with the development of the micanite industry, it is now possible to use the smallest and thinnest sheets of Mica which were formerly considered as waste. Micanite is made by cementing these sheets together with shellac dissolved in spirit and the product can be moulded to assume any shape. India has a monopoly in shellac and this is very much advantageous for the development of this industry which has vast possibilities. Mica plates are used in marine compasses, radio meters, gramophone soundboxes, diaphragms and various types of washers for electrical apparatus. Mica powder possesses an extraordinary colouring power, and it is used for the manufacture of various fancy colours.

As a producer of Mica, India is an easy first, her contribution being well over 55 per cent. while the balance is derived from the United States, Canada, German East Africa and Brazil. The following table gives an idea of the exports of Mica from India:—

| | | 1921. | 1923. |
|---------------|------|-----------|------------|
| Block Mica .. | Cwt. | 4,011 | 12,401 |
| | Rs. | 18,42,469 | 16,46,944 |
| Splittings .. | Cwt. | 17,651 | 70,895 |
| | Rs. | 32,15,314 | 64,29,578 |
| <hr/> | | | |
| Total | Rs. | 50,57,314 | 80,76,522, |

In 1933-34 the total exports of mica were valued at Rs. 44,74,000. The principal customers of Indian Mica are the United States and the United Kingdom. The former absorbed 41.7 per cent. and the latter 34.6 per cent. in 1929 while the corresponding figures in 1930 were 28.9 per cent. and 46.4 per cent.

GEOGRAPHICAL SITUATION.

There are two well-marked Mica Belts in India, one is the Bihar Belt which extends over an area of 12 miles in breadth and 70 miles in length in the districts of Hazaribagh, Gaya and Monghyr. The principal centres of mining in this belt are at Kodarma, Domchanch and Giridih, all connected with the port of Calcutta by the E. I. Railway. At Giridih, mica mining is carried on as an industry subsidiary to coal mining but in the Kodarma area this is the principal industry and the hill tribes of the locality make good miners. The deposits occur at varying depths, and veins have to be followed along uneven surfaces, thus making mining expensive and necessitating the introduction of modern scientific methods. Bihar Mica is known as Ruby Mica owing to its transparency, and it commands a high price on account of its high quality.

The Madras Mica Belt is in the Nellore district between the Veligonda range and the sea and extends over an area 60 miles. As the deposits mostly occur near the surface, the method of open quarrying is followed but in some places as at Kalichedu, mining is carried on modern lines. This Belt may be divided into four regions, Gudur, Atmakur, Kavali and Raipur, the last named contains the largest mines. The Nellore Mica has a greenish colour, hence they fetch a low price in the foreign market. The Mica Belt is situated at a distance of about 125 miles from the port of Madras and is connected with it by the M. S. M. Railway, hence the cost of transportation is very low.

Minor deposits of Mica occur in the Hassan and Mysore districts of Mysore and in Ajmer-Merwara, Jaipur, Kisan-garh and Tonk in Rajputana. The produce of these mines is shipped from the port of Bombay. The Bihar belt is responsible for more than 70 per cent. of the Indian production.

COMMERCIAL VALUE.

From an economic point of view the quality of mica depends mainly on the ease with which it can be split up into thin films and on its transparency. The existence of

any colour, spots, scratches or stains lowers its value considerably. Mica is graded by the trade as Amber, Soft White, Clear Ruby, Stained Ruby and Spotted Electrical Mica. The best Indian Mica is the Clear Ruby which has no imperfections but is transparent and can be split freely. The value of the sheet depends also on the size which, according to the Indian trade standard, varies, from 60—70 square inches to 1 to 2½ square inches.

PREPARATION OF MICA.

Mica Blocks have to be trimmed by hand with sickles in Bihar and shears in Madras. The Bihar method prevents much waste but the shear trimmed sheet has a regular shape, which the former cannot have. The waste mica and tiny scraps can now be converted into Micanite, the ordinary varieties of which are known as “Board”, “Cloth”, and “Paper”.

TRADE ORGANISATION.

The Mining Companies enter into contracts with brokers for the supply of the mica which is packed in paper-lined boxes of the standard weight of 1 cwt. Many brokers make their purchases from various small firms and mix up the mica for export to the broker in London, who stands between the exporter and the consumer. The broker opens the cases and tests the quality and on receiving his report, the purchaser enters into a contract with him or purchases in the open market. In recent years, Mica trade in Bihar has suffered considerably owing to frequent thefts and to the widespread trade in stolen mica, but the Bihar Government have passed a law in 1930 with a view to regulate the transport and trading in mica.

FUTURE PROSPECTS.

The rapid extension of Mica mining in East Africa and Brazil has dimmed the prospect of the Indian industry. There is ample scope for the improvement in the packing, sizing and grading of Indian Mica so as to enable it to secure proper prices in the foreign market. The development of the

Micanite industry should be localised in the Bihar Belt as the shellac manufactured in Manbhum and Sonthal Perganas can be utilised at a low cost. The manufacture of ground mica for which there is a strong local demand in the making of patent roofing materials has great possibilities as this will find an economical use for waste mica.

MANGANESE.

The demand for Manganese has developed considerably within recent years with the expansion of the metallurgical industries. It is used in the form of alloys (ferro-manganese) to counteract over-oxidation, to remove Sulphur and Phosphorous. The Bessemer process of manufacturing Steel has increased the industrial consumption of manganese to about 90 per cent., hence the progress of this industry is bound up with the expansion or depression of the Iron and Steel Industry. In 1921 Steel production established records and the Indian production and export of the ore reached the unique figure of 805,839 tons. The following year saw an unusual depression in the Steel Industry and the production of Steel in U. S. A. contracted considerably and this reacted on the Indian manganese industry, the exports of which fell off enormously.

The continued fall in the price of Manganese-ore from 1924 to 1930 is accounted for by the fact that the rate of increase of the world's production of manganese-ore was much greater than the rate of increase in the world's production of pig-iron and steel.

Ferromanganese and the various manganese compounds are used in the manufacture of dry batteries, disinfectants and drying agents in Varnishes and Paints. They are also in demand in the glazing of bricks and porcelain and as decolorizers in glass manufacture.

The principal competitors in the world's market are Russia, Egypt, Brazil, Cezcho-Slovakia and the Gold Coast. In 1923, out of the world's total production of 1,830,000 tons India contributed 695,055 tons or 38 per cent., while Brazil's share was 232,041 or 13 per cent., Russia's 407,401 or 27 per

cent. and that of Gold Coast was 139,634 tons. The Russian exports fell off considerably between 1915 and 1922 owing to internal political troubles and the Brazilian production does not show signs of expansion owing to the railway facilities. The most serious rival of India in the near future is likely to be the Gold Coast, where the deposits are situated on the eastern side of the Taquah Banket Range, very close to the sea-port of Sekondi. The U. S. has no deposits of good quality but she can always depend on Brazilian manganese, and she has also developed her manganiferous iron ores as substitutes for superior quality of manganese. Another possible rival is South Africa where large deposits of the ore have been found at Postmasburg.

The Indian share of the manganese import trade of the U. K. in 1918 was 88.9 per cent. but in the pre-war period it was 51 per cent., while Russia had 37 per cent. and Brazil 9.7. In recent years, the Russian exports have begun to expand. The following table indicates the distribution of the exports of Indian Manganese in 1932.

| | | | |
|----------|----|----|---------------|
| Belgium | .. | .. | 133,523 tons. |
| France | .. | .. | 164,132 „ |
| Germany | .. | .. | 9,000 „ |
| Italy | .. | .. | 14,079 „ |
| Japan | .. | .. | 1,438 „ |
| Holland | .. | .. | 12,200 „ |
| U. K. | .. | .. | 307,921 „ |
| U. S. A. | .. | .. | 96,845 „ |

Total .. 739,888 tons.

In addition to these exports, about 228,850 tons were consumed by the Iron and Steel Industry at Jamshedpore, Kulti and Burnpore. It is expected that with a gradual expansion of home metallurgical industries, the exports will gradually decrease, but for a long time yet, Indian manganese will be able to dictate terms to the U. K. and U. S. A.

Manganese deposits are distributed all over the Deccan plateau. There are roughly 6 Manganese Belts in India,

(1) the Central C. P. Belt extending over the districts of Balaghat, Bhandara, Chhindwara and Nagpur, (2) the Kathiawar Belt extending over the Panchmahal district of Bombay and the Jhabua State of Central India, (3) the Western Orissa Belt covering the district of Singhbhum, and the Keonjhar, Bonai and Gangpur States, (4) the Vizagapatam Belt in the extreme north of the Madras Presidency, (5) the Bellary Belt, (6) the Mysore Belt.

Most important of these, alike from the point of view of quality and quantity, is the Central C. P. Belt as here the bodies of ore are large in size and are superior in quality. The deposits are fairly continuous in one area in the Nagpur district extending over 12 miles at a stretch. The area is well served by railways and the geographical situation is very favourable for the transport of the ore to the Bombay or Calcutta ports. With the opening of the railway line connecting Nagpur with Vizagapatam, the main export traffic is likely to be diverted to that port.

QUANTITY OF MANGANESE ORE PRODUCED IN INDIA IN 1933.

| | | | |
|-------------------|----|----|---------------|
| BIHAR AND ORISSA | | | |
| Singhbhum | .. | .. | 7,453 tons. |
| Bonai State | .. | .. | 3,115 .. |
| Keonjhar State | .. | .. | 60,407 .. |
| CENTRAL PROVINCES | | | |
| Balaghat | .. | .. | 20,501 .. |
| Chhindwara | .. | .. | 8,228 .. |
| MADRAS | | | |
| Sandur State | .. | .. | 101,260 .. |
| Vizagapatam | .. | .. | 16,698 .. |
| MYSORE | | | |
| Shimoga | .. | .. | 280 .. |
| Other Centres | .. | .. | 365 .. |
| | | | <hr/> |
| | | | 218,307 tons. |

Two Manganese Belts are in close proximity to centres of iron smelting. The Gangpur deposit in the Orissa Belt has

a 50 per cent. manganese content and a large portion of the output is utilised by the Steel Works at Jamshedpore, Kulti and Burnpore and the surplus is shipped from Calcutta.

The Mysore Belt does not compare with the Central Province deposits, but there is a local demand for the smelting of iron at Bhadravati, and owing to the comparatively higher railway and sea freights, it is not possible to work the deposits of lower grades there or in the Sandur Hill deposits of the Bellary district where the deposits are more extensive. The Vizagapatam Belt has manganese of the second and third grade and the chief deposits are at Garbham and Kodur. As it is close to the port of Vizagapatam, the cost of transport is very low, and most of the ore is exported. This ore, owing to the high iron content is used for the manufacture of basic iron.

TRADE.

Calcutta and Bombay are the most important ports for export, while Vizagapatam and Mormugao have also some exports. The principal markets in England are London, Liverpool and Middlesborough while the continental supplies go to Antwerp. Importing firms in England work on the basis of long term contracts with the purchaser and in their turn they secure their position by agreement with the mining firms. Some English Steel firms own manganese mines in India or have direct connections with them.

GOLD.

Though rich in a variety of minerals Nature has bestowed only a meagre supply of gold on India. India ranks eighth among the gold producing countries of the world and her output does not exceed 3 per cent. of the world's production. Gold is washed from the sandy beds of many rivers, such as the Subarnarekha, the Dihong in Assam and the Irrawady near Myitikyana but the results have not been remunerative. The principal gold zone of India is at Kolar, a place about 40 miles east of Bangalore in Mysore. From this field we get about 98 per cent. of India's gold production.

There is a single vein extending over 4 miles and the breadth does not exceed four feet, but the depth is very great, at places like the Champion Reef and Oorgaum exceeding 6000 ft. The Kolar area is well connected by the lines of the Madras and South Marhatta Railway. Electric energy generated at the Sivasamudram falls on the Cauvery is transmitted to Kolar over a line extending over 92 miles and this has brought down the cost of production considerably. The Mining Companies have made large profits in the past and the income of the Mysore State from royalties is considerable. Over 20,000 men are employed in these mines. The entire output is purchased by the Bombay Mint, thus the mine has a ready home market. There are two other mining areas, one in the Anantapur district of Madras and another in the Hathi district of Hyderabad State, but these are not so successful as Kolar.

PETROLEUM.

As an illuminant, Petroleum has been known from early times in China and Japan and mention of it is found in the works of Herodotus, Strabo and Pliny. It is "the greatly altered product of minute forms of plant and animal life trapped in some of the sediments laid down in ancient seas. In the process of its formation, the oil and its associated products moved sideward, or upward, under pressure and much of it escaped." The oil occurs at some depth and gas covers it. Mining operations are started by sinking an artesian well with an elevated structure called the rig above it. The rig is generally 70 ft. in height and the main portion of it is called the Derrick from which the drilling tools are suspended and are driven by steam power. Sometimes dynamites are employed to get into greater depths and also to increase the output. In surface deposits the oil gushes out while in others it has to be pumped up into huge tanks. Refining of this crude oil is carried on with a view to separate the petroleum of various qualities and for extracting burning oil, gas oil, lubricating oil and paraffin.

USE.

Petroleum has great importance in modern times owing to its use as fuel in transportation by land, sea and air. The increase of motor transport in peace and war has brought about a tremendous demand for petroleum. The gradual development of the commercial use of the aeroplane has necessitated a wide distribution of petrol supplies all over the world as the air routes are determined to a large extent by the petroleum deposits and facilities for the supply of petrol. The wars of the present times are fought to a large extent over securing the areas producing petroleum. Turkey fought against Russia for the occupation of the oil supplies of Baku. Engineering factories and munition works require it for lubrication and fuel, and its use in domestic industries is increasing rapidly in a variety of ways.

The U. S. A. leads in the production of Petroleum with a percentage of 63.8 per cent. Petroleum is well distributed all over the world excepting South Africa and Australia. During recent years Mexico and Persia have made rapid progress in the production of petroleum, while Russia has declined in importance. In 1918 the Mexican output was not more than 63 million barrels and in 1921 it had increased by more than three times to 193 million barrels. Persia was sixth among petroleum producing countries in 1918, now her place is fourth. India is not a great petroleum producing country, her contribution is just over 1 per cent.

WORLD'S DISTRIBUTION OF PETROLEUM.

| | | | |
|------------------|----|----|----------------|
| I. U. S. A. | .. | .. | 63.8 per cent. |
| II. Mexico | .. | .. | 23.5 „ |
| III. Russia | .. | .. | 3.6 „ |
| IV. Dutch, E. I. | .. | .. | 2.5 „ |
| V. Persia | .. | .. | 1.8 „ |
| VI. Roumania | .. | .. | 1.1 „ |
| VII. India | .. | .. | 1.1 „ |
| VIII. Others | .. | .. | 2.6 „ |

DISTRIBUTION IN INDIA.

India has three distinct zones of petroleum deposit, one the eastern extends over Assam, the second over Burma, and the Islands near the Arracan Coast; while the western zone is the North-Western Frontier and the Punjab.

In Burma, petroleum occurs in the basin of the lower Irrawady and the Chindwin on the eastern side of the Arakan Yoma. This Belt includes the oil fields of the Upper Chindwin, Yenangyat in the Pakokku district, Singu in Miyingyan, Yenangyang in Magwe district, Minbu and Thayetmyo. The most important field is the Yenangyang extending over $1\frac{1}{2}$ square miles with an average annual output of 180 million gallons. From the wells the crude oil is transported by pipes to tanks on the river bank where it is pumped into specially constructed flats or floating tanks which are towed by the Irawady Flotilla Co.'s steamers to Rangoon where it is refined in the Oil Co.'s works at Syrium and Danidaw. This field is being worked by the Burma Oil Company and the Asiatic Petroleum Company. Next in importance is the Yenangyat field with an average annual output of $2\frac{1}{2}$ million gallons but it is apprehended that in the near future this field will be exhausted. Singu is a comparatively new field and the output is rapidly on the increase. Oil is also found in the eastern Baronga Island near Akyab and in the Ramri Island in the Kyaukpyu district.

The two most important oil areas of Assam are in the Lakshimpur district at Digboi and at the southern end of the Khasi and Jaintia Hills. The average annual output of the Digboi fields exceeds 7 million gallons. The main products of the Assam fields are petrol, jute-batching oil, lubricating oil which are in great demand in the Jute industry of Bengal, paraffin wax from which candles are made and kerosine of inferior quality.

The Punjab Belt has only recently been tapped and the most important field is at Kanaur in the Attock district, where the output in 1923 exceeded $11\frac{1}{2}$ million gallons. The industry has received a great impetus by the opening of a

Refinery at Rawalpindi with a daily capacity of 65000 gallons of crude oil. Punjab petroleum has removed a long-felt want of Western India for the supply of fuel for industrial purposes.

The following table gives an estimate of the production of petroleum of the three petroleum producing Provinces of India :—

| | 1920 gallons. | 1930 gallons. | 1933 gallons. |
|--------|------------------|------------------|------------------|
| Burma | 270,707,170 | 256,554,027 | 249,000,899 |
| Assam | 13,358,172 | 46,813,881 | 57,008,123 |
| Punjab | 51,492 | 7,662,200 | 4,236,136 |
| Total | 293,116,834 | 311,030,108 | 306009,022 |

TRADE.

In addition to the output of her own oil fields, India has to import kerosine oil, fuel oil and lubrication oils from various countries. The imports gradually increased from 60,441,150 gallons in 1918 to 132,903,605 gallons in 1922 and 200 million gallons in 1925 but owing to the greater utilisation of the home output, the imports declined to 108 million gallons in 1930 valued at Rs. 591 lakhs. Our principal source of imported mineral oil is the United States but during the past decade the supplies from Persia are steadily rising.

IMPORTS OF PETROLEUM INTO INDIA IN 1933.

(Thousands of Gallons.)

| From. | Kerosene Oil. | Fuel Oil. |
|------------------------|---------------|-----------|
| U. S. S. R. .. | 41,946 | .. |
| Roumania .. | 6,216 | 8,767 |
| Persia .. | 302 | 64,584 |
| Straits Settlements .. | .. | 150 |
| Borneo .. | .. | 27,613 |
| U. S. A. .. | 1,164 | .. |

Among the refinery products of petroleum, paraffin wax is exported in large quantities and the quantity increased from 303,153 cwts. in 1913 to 486,476 in 1918. Before the war, besides the U. K. our chief customers were Japan, Australia, South Africa and Hongkong but the embargo on the export of Paraffin to countries outside the British Empire put a check on the exports for sometime. South Africa and Portuguese East Africa are our regular customers. It is a pity that very little of wax is used in India for our manufacture.

COPPER.

Copper is found in many parts of India, *e.g.*, Singhbhum in Chota Nagpur, near Darjeeling, Sikkim, Bawdwin in the Northern Shan States, Garhwal and Nellore in Madras, but nowhere the ore is worked on a big scale except in Singhbhum where the Cape Copper Company is working the 80 miles long Copper Belt in the Mosabani and Matigara areas. The output of the Company reached 3063 tons in 1923 and a smelting plant capable of producing 1000 tons of refined copper annually has been set up. In 1920 the Mosabani area was opened up and a large dressing, smelting and refining plant was set up near Ghatsila. Since 1929 the annual output has gradually increased until in 1934 the quantity of ore raised was 328,680 tons. Though Copper mining is not extensively carried on, the manufacture of household utensils from copper and its alloys is flourishing and for this industry, India imports about 450,000 worth of Copper Ore. Almost every large village has its coppersmith and brass worker, but the tendency now-a-days is the concentration of these industries on a bigger scale in important towns. There is a wide diversity of designs and workmanship. Besides copper vessels, brass and bell metal utensils are also used. Brass is an alloy of copper and zinc and it is imported in the form of sheets, while the inferior and cheaper utensils are made from Kansa and Phul (Bell metal). Kansa is a compound of Copper, Zinc and Tin while Phul is made of Copper and Tin. There are two methods of manufacture, one is the casting of the metal into

moulds and the other is hammering out the metal into shape. The former process is simpler and the output greater but the articles are not durable. The latter process entails very hard labour, as after the lump of metal is hammered into shape, the rims have to be planed, the black colour has to be filed out of the surface, then the rims have to be chiselled and polished. Usually the hammering work is done by strong and muscular labourers who have specialised in this work. There is enough scope for improvement in this industry especially by the introduction of treadle lathes and grinders for the purpose of shaving, grinding and scraping. There is a marked difference between the Hindu and Muslim styles in the shape of the articles, the Hindu articles being flatter with a broad base and are melon-shaped while the Muhammedan waterpots are narrow and taller in size with a spout attached to them. In Bengal, Khagra, Bankura, Malda, Rungpur and Purbasthli, in Bihar, Siwan, Balasore, Sambalpur and Jayanagar; Moradabad in U. P. and Godavari in Madras are well-known centres of manufacture.

Besides these, the demand for aluminum utensils is fast increasing owing to their cheapness. Aluminium is extracted from bauxite which is found at Katni in the Jubbulpur district, Belgaum and Kapadvanj in Khaira district of Bombay and it occurs also in the red laterite deposits of South India. This industry was inaugurated at the instance of Sir Alfred Chatterton who started a State aided factory in Madras. This factory proved a success and it has now been taken over by the Indian Aluminium Company, who manufacture not only aluminium sheets but also plates, cups, saucers, pans and bowls which are fast displacing the English and Japanese product. Caustic Soda and bleaching powder are the bye-products of this industry and these form also the raw materials for the manufacture of paper, hence the development of the Aluminium industry is likely to give a stimulus to the Paper industry.

SALT.

Salt is of the greatest importance to the Indian who cannot think of sitting to a dinner in the preparation of

which salt has not been used, and the poorer persons are often satisfied with a plate of rice and a pinch of salt. It is consumed directly with meals or as an ingredient in the preparation of various dishes.

India's total consumption of salt exceeds 2 million tons, of which the home production is 75 per cent. while the balance is imported. The consumption per head amounts to about 14½ lbs. per annum.

SOURCES.

The most important sources of Indian Salt are:—
(1) from sea-water, (2) from inland lakes and sub-soil water, (3) from Rock Salt deposits.

About 60 per cent. of the local production is from the sea salt of the Madras and Bombay coasts. The sea water is drained inland by means of pits and it is left there to evaporate. Part of this manufacture is carried only directly by the Government and part by means of licenses. The centres of production in the Bombay coast are in places where the sea is shallow, *e.g.*, at Dharsana and Charwada on the south of the Gujerat Coast, and near Bombay city. Another important centre is the Runn of Cutch which is very shallow and the saline content of the water is high. Salt is produced by solar evaporation, and this salt is well-known as Bargara Salt. There are scattered all over the Madras coast small factories for the manufacture of salt. The total production of the Madras and Bombay coasts exceeds 1,017,000 tons or about 66 per cent. of the total Indian output. Owing to the discharge of the immense volumes of fresh water by the Ganges, the Brahmaputra and the Mahanadi, the Bengal and Orissa Coasts are not favourable for the production of sea salt.

The next important source of salt is the inland lake salt of Rajputana. This zone is in the desert area of Rajputana where the soil contains a very high percentage of salt, and fine particles of salt are carried by the high south-western winds in summer from the Runn of Cutch and are deposited in this zone where during the rains they are

washed into the lakes. The Sambhar Lake with an area of 90 miles is the main centre of production, where by the construction of a concrete dam at Japog a reservoir with an area of 5 square miles has been made for storing the saline liquor. Direct railway lines connect the works at the Lake with the Sambhar Station for quick transport and distribution of the salt. 68 per cent. of Sambhar Salt goes to the U. P. and 12 per cent. is consumed locally. Central India takes 6 per cent., Bihar and Orissa 7 per cent. and the Punjab 3 per cent.

The Salt mines of the Punjab have been worked from before the days of the Moghuls and the deposits have an average thickness of 550 feet in the Salt range near Khewra. The area has been tunnelled and most up-to-date methods have been employed for drilling. The distinguishing colour of the salt is pink while the salt of the Kohat Mines where it is obtained by quarrying is grey. Open quarrying is also done in the deposits of the Mandi State at Guma. Punjab rock salt amounts to 10 per cent. of the total Indian production.

The imports of foreign salt are gradually decreasing. The total quantity imported in 1930 was 688,629 tons while that in 1933 was 396,818 tons. 30 per cent. of our imports come from Aden, 17 per cent. from Egypt, 8 per cent from the United Kingdom at Liverpool, 17 per cent. from Italian East Africa, 12 per cent. from Spain and 13 per cent. from Germany. The imports from the United Kingdom are decreasing while those from Spain and Germany are rising.

SALTPETRE.

From very early times India has been a great producer of saltpetre. The manufacture is localised mainly in North Bihar where all the conditions essential for its production are present. The density of population in this region is well over 500 to the square mile and the animal population owing to the predominance of agriculture, is also large thus ensuring a large supply of organic nitrogen. The mean temperature does not exceed 78 degree Fahrenheit and this favours

the development of the nitrifying organism. Owing to the general use of wood and cowdung as manure, the potash supply is quite abundant and the steady rainfall after a hot summer favours the formation of a surface efflorescence of potassium nitrate. Besides North Bihar, saltpetre is also made in the Cawnpore, Ghazipore, Allahabad and Benares districts of the U. P., the Hissar district of the Punjab, Coimbatore, Salem, Kistna, and Vellore districts of Madras. At one time the principal export trade of Bihar was in saltpetre and the East India Company had factories all over the country for the collection and manufacture of saltpetre. Even to-day its usefulness in the making of gunpowder is undisputed and it is also used for dyeing along with lac and as a flux in glass manufacture and also as fertiliser.

The average exports amount to 14,271 tons valued at Rs. 48½ lakhs. Our principal customers are the United Kingdom (29 per cent.), Ceylon (19 per cent.) Mauritius (18 per cent.) and Hongkong (15 per cent.). Before the war the United States were great importers of Indian saltpetre but their place has been taken by the United Kingdom. It is now being used in large quantities as a manure in the tea districts of Assam.

CHAPTER VIII.

FORESTS.

India is endowed with enormous forest resources which have yet been only partially exploited. About 22 per cent. of the whole area of the country is covered by forests amounting to 249,710 square miles in 1930. Burma and the Andamans have the largest forest areas, the proportion to the whole area of the Province being as high as 67 in the case of the former and 69 in the case of the latter, while in Assam it is 40 per cent., in Coorg 32.8 per cent., the Central Provinces 19.6 and among the major provinces Madras, Bombay and Bengal have each 13 per cent. *Burma 67
Assam 69*

Over such a wide area it is no wonder that the forest vegetation presents an infinite variety. Various climatological and physical factors have combined to produce these diverse types of forest vegetation. Rainfall exerts a considerable influence on forest growth but its quantity and distribution are determined by the geographical situation of the area and by various other causes. The Assam and Sunderban forests lie in the direct route of the monsoons, hence they receive a heavy rainfall while the forests in Sind, Rajputana, Baluchistan and Southern Punjab do not get more than 20 inches of rain, hence the varieties of trees in these forests are very few. Altitude to a large extent determines the types of forest vegetation, as oaks and laurels are found in Assam and Burma at elevations of 3000 to 7000 feet while in the North-Western Himalayas, Deodar exists at very high altitudes exceeding 7000 feet. Trees belonging to the Mangrove species are found in sea coasts which are inundated by high tides. Soil is another factor which differentiates the forest vegetation as some species of trees luxuriate on alluvial soil while others grow on rocky soil.

The Belt of Deciduous forests extends from the bases of the Himalayas to the Deccan Tableland having an average annual rainfall varying from 50 to 75 inches. These forests supply some of the most valuable timbers, *e.g.*, Teak, Sal Sandal, Rosewood, Ebony and Iron wood. The ever green forests occur in areas of heavier rainfall, exceeding 100 inches in the Eastern Sub-Himalayan region, in the west coast of the Deccan, Burma and in the Andamans. The most important species of this Belt are Toon, Wild mango, Artocarpus, etc. The Coniferous forests of Northern India, Burma and Assam are situated at high altitudes and among the varieties of trees found in them are the Pines, Juniper, Birch, Fir, Spruce, Oak, etc. The Tidal forests are located on the sea coast and on tidal creeks and are liable to inundation. These are found in the Sunderbans of Bengal, Burma coast and northern portion of the Madras Coast. These forests produce Sundri wood and enormous quantities of fuel wood. For administrative purposes the forests have been classified into Reserve, Protected and Public Forests. The Reserve forests are administered for the supply of timber, fuel and other forest produce, and also for their influence on climate, rainfall, water storage and prevention of denudation. In the Protected forests, the commercial utilisation of the forest products is kept in view and the Public forests are kept open for the use of the public.

The economic value of forests consists not only in the supply of timber and firewood, grass for house thatching and grazing for cattle, various oils and tan stuffs but in their intimate connection with agriculture. Although forests have very little marked influence in increasing or decreasing the rainfall of any area, a denudation of the catchment area is a principal cause of the sudden floods in the rivers. The floods which frequently cause great destruction to crops in Orissa are to a very large extent due to the denudation of the Chota Nagpur hill slopes. In the Punjab the damage which had been made to the Hoshiarpur Chos and the Salt Range was mainly due to the denudation of forests. The action of the forest in regulating the water supply and in

the prevention of the soil erosion is therefore very important. The rain water rushes off the surface of the denuded hill slopes and forms ravines by cutting into the soil, while the roots of forest trees retain the water and reduce the speed of the outflow. The ravines on the banks of the Jumna, or in the hill slopes of the Santhal Perganas illustrate this. The forests render a further service by increasing the relative humidity of the atmosphere as well as of the soil.

The deterioration of the waterways in Western Bengal is also to a great extent caused by the rapid clearance of the forests in the Ranchi Plateau. As a result of this, silt is being deposited in the beds of the Bengal rivers in large quantities causing overspilling and floods. The same problem had presented itself in the United States in connection with the clearance of the forest areas in the southern Appalachian Mountains and it was recognised that "the conservation of stream flow depends upon the condition of the drainage area and that to ensure perpetuation and the proper conditions, it is necessary to preserve the forests and to keep the land surface in tact" (*Official Report*, 1903).

The forest wealth of India consists of timber and fuel, bamboos, grazing and fodder grass, and other minor produce. The average amount of timber removed from the State forests in 1930-31 was 322,852,830 cubic feet. The varieties offer a wide diversity and are adapted for all kinds of uses. The *Sal* is one of the most valuable of the Indian timbers having a wide reputation for great strength and durability. It is used extensively for making railway sleepers, in bridge and building construction. Besides these, Sal resin is burnt as incense and is also used in medicine. It grows throughout the entire sub-Himalayan tract, in Chota Nagpur and Orissa, in the Central Provinces and the Ganjam district of Madras.

Teak is grown in the Himalayan slopes and in the forests of Central India, Deccan, Malabar, Cochin, Travancore, Bombay and Burma. Indian teak is used in ship-

building, in cabinet and furniture work as well as in building railway carriages. There is a considerable export of teak from Burma amounting to 53,893 cubic tons in 1926, the principal market being the United Kingdom where it is used in ship-building. The principal ports engaged in this trade are Rangoon and Moulmein.

The Pine, a Himalayan tree, is in wide demand for making railway sleepers. The *Sisoo* grows in the sub-Himalayan tract and it is extensively used in making furniture, cart and carriage frames, etc. The Deccan counterpart of the *Sisoo* is the Blackwood, which is exported to Europe for cabinet work. The *Toon* is a red wood and it is used also for furniture making. The *Deodar* grows on very high altitudes in the Western Himalayas. It is well-known for its durability and immunity from white ants. It is used in that type of work where strength is the main consideration, *e.g.*, making carriages, wheels, etc. It has the durability of the *Sisoo* and it possesses the additional quality of seasoning well. It is well adapted for wood carving.

Sandal wood grows mainly in Mysore and in the districts of North Coimbatore, Arcot, Salem, Bellary and in the Nilgiris. The heartwood which is yellowish brown in colour is used for carving and the oil has great medicinal properties and it is used in perfume making. In Mysore, the trees belong to the State and the wood is collected by State Agency and put up to public auction. Sandal wood is exported in very large quantities to the United States, but owing to the gradual industrialisation of the country, distillation of the oil has been commenced in Mysore in two well equipped factories. Export of the oil in place of the wood means a considerable reduction in the freight. Besides the United Kingdom and France, Japan is an important market for the oil. Mangalore, Tellicherry and Cochin are engaged in the export of the wood while the principal ports for the export of the oil are Madras, Mangalore, Calcutta and Bombay.

Among the other valuable timbers are the *Babul*, a tree of the dry tract, the bark of which makes a good tanning

agent, the *Sundri*, a tree of the tidal forests, utilised in making boats, masts and wheels. The *Gurjan* which grows in the Andamans, Assam and Burma, yields a valuable oil.

The minor products of the forests consist of the bamboo fibres, essential oils, tanning materials, oleoresins, gums, rubber and drugs and spices. The fruits of *Bombax Malabaricum* yield a floss which is very valuable as a fibrous material. The seed of the *Mahua*, which grows in the forests of the Central Provinces and Bombay Presidency, has a high oil content and it is mainly exported to England and Germany. The *Chalmugra* grows in the Khasi Hills and in Sibsagar and its oil has much medicinal value.

Indian forests are particularly rich in tanning materials which are in great demand both in India and for export. The Myrobalam, Babul pods, Mangrove barks, Babul and Tarwad barks are the principal tanning materials. The Mangrove forests occur in the coastal forests. The Babul bark is used in tanning the sole leather and is very effective when used with myrobalam. The Tarwad is a tree of dry areas and it is the standard tan bark of Deccan.

Among the essential oils, the Lemongrass oil is the most important, the main centre of the industry being Travancore and Malabar. The oil is exported from Calicut to Europe and the United States. A very important industry has developed in Kumaon in which the Himalayan Pine forests are tapped for the extraction of the resin. It is expected that within a short time this industry would be in a position to supply the entire Indian demand for turpentine and resin. The centre of this industry is at Bhowali which is at an elevation of 5500 feet and has an adequate supply of cold water as well as of the timber from the extensive oak and pine forests of the neighbourhood. At Jallo in Lahore district there is a Government turpentine factory. Some idea of the great possibilities of the development of this industry can be made when the area under the pine trees is taken into consideration. The Chirpine covers alone an area of 3300 square miles while the other varieties of pine extend over 3200 square miles.

The development of forest industries is very much handicapped by the lack of facilities for the transport of timber and forest produce as the forests are situated in places which are practically inaccessible. Human agency is employed for removing bamboos and fuel to short distances or for carrying sleepers to the slides or streams. Where roads exist heavy carts drawn by bullocks or buffaloes are used, while in Burma and in the Andamans, elephants drag heavy timber to the rivers. Forest tramways exist in some places in India, *e.g.*, in Goalpara (Assam), in the Andamans, in the Changa Manga (Punjab) while ropeways have been constructed in the Rawalpindi forests and near Cherapunji in Assam. The rivers are used wherever possible for floating the timber and rafts of bamboos, but in many cases, this is only possible for some months in the year when the rivers are in flood.

About one half million of the population is engaged in forest industries which include sawing, basket-making, bamboo work, carpentry, extraction of resin, etc. The timber is usually sawn in mills located near the forests so as to prepare it for transport. Burma has 100 Saw Mills, Assam 8, Bombay 3, the Central Provinces 2, Bihar and Orissa 4, while the largest Saw Mill in South India is at Kallai near Calicut. Furniture making is carried on near big towns irrespective of the availability of good timber in the locality. Chandernagore in Bengal, Dinapore in Bihar, Bareilly and Saharanpore in the United Provinces being the chief centres of this industry.

The Coconut oil cake or poonac is well suited for fattening cattle. The fruit is also consumed by the people and the kernel used in making sweets. In Bombay the tree is tapped for juice from which toddy is made. Besides these, the stem of the leaf is used for carrying loads on the shoulders of coolies, for making fish rods while the sap is used in making vinegar and sugar. The shell of the nut is not wasted as serviceable drinking cups, tooth powder, spoons, hookas and knife handles are made out of it. The trunk of the tree is utilised for making rafters, sailing boats,

troughs and furniture. The manufactured coir is mainly exported to the United States, the United Kingdom, Germany, Holland and France, while coir matting is sent to the Straits Settlement and the United Kingdom. Allepy, Cochin and Calicut are the principal ports engaged in the export trade.

The manufacture of coir matting is one of the main industries of the Travancore State, and 36 per cent. of the industrial workers are engaged in it. The value of the exports of coir matting amounts to about Rs. 2 crores or about 16 per cent. of the value of the total exports from the State. The imposition of high import duties on this article by the U. S. A. has seriously affected this industry.

In Shellac, India has a monopoly and the history of lac production dates from ancient times, when dyes were made from lac. With the use of synthetic dyes, however, the lac industry underwent a period of depression but with the discovery of new uses of it, it received a new lease of life. Shellac is made from the raw material, grain lac or bottom lac and it is used in the manufacture of varnish, gramophone records, and as a stiffening material in hats. It is also used as an insulating substance in the making of electrical machinery and for lacquering work. According to the estimate made by an expert about 40 to 50 per cent. of the world's demand for shellac is for the manufacture of Gramophone Records.

Shellac is made from the thick resinous substance exuding from the bodies of lac insects living on some trees, *e.g.*, *Kusum*, *Palas*, *Ber* and *Ghout*. Lac growing, therefore; depends upon the existence of these trees and upon certain climatological factors. *Kusum* is found in the tract from the Sutlej eastwards to Burma including South C. P., Chota Nagpur and Orissa. It grows scattered at high altitudes. *Palas* is a gregarious tree and grows wild in the plains. *Ber* is to be found all over the plains and it is propagated from the seed, hence it is easy to extend its cultivation. *Ghout* is a forest tree and is very common in Central India and in C.P. We have not much definite knowledge about the climatic factors, but this much can be stated that the insect flourishes at altitudes of over 1000 feet with a temperate

climate free from frosts and with a moderate rainfall not exceeding 60 inches. From a consideration of these facts, it will be apparent that the lac cultivation is scattered all over India. The most important area of its cultivation, however, is Chota Nagpur, Orissa, Santhal Perganas, the Chattisgarh Feudatory States and the North-eastern districts of the C. P., the Bankura, Birbhum, Murshidabad and Maldah districts of Bengal and the southern portion of the Mirzapur district of the U. P. The Chota Nagpur area contributes alone 87 per cent. of India's crop.

This area is served by the two main lines of the B. N. Railway and the Grand Chord line of the E. I. Railway but over a wide area, particularly in the hilly tracts of Orissa the absence of any suitable means of communication is a great obstacle to the development of this industry and to the proper marketing of the produce. The stick lac has, therefore, to be carried over long distances in head loads, on bullock carts or by boats before it reaches the railhead. The grower is usually a petty ryot with little or no education and very little capital and he very often gives up the rearing of lac when prices fall. The wandering trader or *Bepari* purchases from him and markets the produce through the *Aratdars* by means of open auction or by secret bidding in which the purchaser, the seller and the *Aratdar* sit down with their right hands extended under a piece of cloth and bids are made by signs of the fingers. The principal lac markets of India are Balarampur and Jhalda in Manbhum, Ranchi, Imamganj in Gaya, Garhwa in Palamau, Pakur in Santhal Perganas, Bhandara and Raipur and Katni in C. P., Ahraura in Mirzapur and Umaria in Central India. At these centres collections of stick lac are made which are then despatched to the centres of manufacture as Mirzapur, Jhalda, Balarampur, Pakur, Umaria, Imamganj and Ranchi from where the shellac is despatched to Calcutta for export. There are 27 shellac factories at Balarampur and 15 at Jhalda all equipped with mechanical crushers. By far the most important manufacturing centre in India is Mirzapur in the U. P. There is no large lac growing tract in that district but

the raw material is drawn from the C. P. and Berar, and from the Palamau district. There are over 40 factories at Mirzapur employing about 3500 labourers. One of the main causes of the localisation of the industry at Mirzapur is the grant of preferential rates for the transport of Shellac which the E. I. Railway has allowed to Mirzapur by which shellac is carried at As. 13-3 per maund instead of at Re. 1-3-7.

The local demand for lac does not exceed 1000 maunds in India, the chief industrial uses of it in this country being in the carpentry industry as varnish. Silversmiths and book-binders use it as a stiffening medium and it is in demand at Moradabad for the enamel industry.

Our total exports of lac were valued at Rs. 1,83,94,000 in 1931. The U. S. A. are our most important customers as they purchase 60 per cent. of our exports. The United Kingdom comes next while Germany, Japan and France are the other important markets. The major portion of the exports is in the form of orange shellac while about 5 per cent. is garnet lac and 3 per cent. is button lac. India's monopoly in this important article will remain uncontested till any synthetic substitute is found, but in recent years the exports have seriously declined, particularly of shellac and button lac, owing to the increasing employment of nitro-cellulose lacquers for paints and varnishes. The future of this shellac therefore seems to be intertwined with the development of the Gramophone industry.

TOTAL EXPORTS OF SHELLAC IN CWT.

| | | | | |
|------|----|----|----|--------------|
| 1917 | .. | .. | .. | Rs. 2,91,500 |
| 1919 | .. | .. | .. | „ 3,12,900 |
| 1921 | .. | .. | .. | „ 3,49,900 |
| 1923 | .. | .. | .. | „ 4,55,900 |
| 1925 | .. | .. | .. | „ 4,12,500 |
| 1928 | .. | .. | .. | „ 5,19,100 |
| 1930 | .. | .. | .. | „ 4,23,750 |
| 1933 | .. | .. | .. | „ 3,81,200 |

EXPORTS OF SHELLAC IN 1926 BY COUNTRIES.

| | | | |
|-----------------|----|----|-----------------|
| United States | .. | .. | Rs. 3,07,52,000 |
| United Kingdom | .. | .. | „ 1,09,10,000 |
| Japan | .. | .. | „ 19,37,000 |
| France | .. | .. | „ 18,12,000 |
| Germany | .. | .. | „ 52,01,000 |
| Philippines | .. | .. | „ 5,500 |
| Netherlands | .. | .. | „ 4,37,000 |
| Other Countries | .. | .. | „ 36,20,000 |

Paper-making is an old industry of India. Foreign travellers have recorded that in the early sixteenth century, paper notes circulated at Cambay and that merchants kept their accounts in long sheets of yellow paper. In Kashmir, paper used to be made from rags and fibres and even to-day paper is made from barks of trees in Nepal. At Arwal in Bihar and in the Dacca district of Bengal handmade paper is even now made in small quantities.

There are nine paper mills in India, three in Bengal, one in the U. P. one in the Punjab, one in Bombay, one in Surat and two in South India. These mills work with wood pulp imported from the United Kingdom, Sweden, Norway and Germany and also use local grass for inferior qualities of paper. The Great War, by cutting off the supplies of paper and wood pulp from Germany and Austria, gave a great impetus to this industry in India. The total consumption of paper in India exceeds 1,46,861 tons out of which India produces about 40,000 tons and the rest is imported from the United Kingdom, Germany, Austria and Belgium the per capita consumption in India is about 1 lb. as compared with 152 lbs. in the U. S. A., 81 lbs. in U. K., 48 in Germany, 40 in France, 18 in Japan and 5 lbs. in Egypt. In 1933 the imports of paper and paste board declined from 2,640,000 cwts. valued at Rs. 2,86 lakhs to 2,564,000 cwts. valued at Rs. 2,63 lakhs.

The conditions necessary for the development of the Paper Industry are the supply of suitable raw material, availability of water, cheap labour and proximity to a market.

Indian paper is made from wood pulp, rags and grass. Wood pulp is imported from foreign countries. It is at first converted into fine powder, then treated with soda and other chemicals to make chemical pulp. This pulp is next bleached and loaded with China clay, alum and resin after which it is spread over a wire net for draining off the water, then it is passed through rollers after which it emerges as paper. The grass used in making paper are the Bhaib, Bhabar and Sabai grass. Sabai is a perennial and it grows in dry climate from Chota Nagpur to Nepal. In Bihar and Orissa, the principal exporting centres are Sahebgunj and Bettiah. The mills near Calcutta and Lucknow derive their supplies from this area. Owing to the existence of vast supplies of Bhabar grass in the western Jumna Canal region, a Paper Mill has recently been started there to make paper from it. This mill has a great advantage over the mills in Bengal in having the raw material in close proximity. In recent years the bamboo has been used as a material for paper-making and this has opened up immense possibilities for the Indian Paper Industry. Extensive tracts in the Nepal Terai, in the forests of the lower Assam Hills, in the Sunderbans, in Arakan, Tennaserim, Tavoy and Mergui in Burma; Angul in the Province of Orissa, the Orissa Feudatory States in the Eastern States Agency, in Papanasam, Rakapalle and Madasewaranamali in Madras and Kanara in Bombay have extensive bamboo plantations.

The utilisation of bamboos for paper-making will "enable India to produce 10 million tons of pulp per annum. Already the cost of production of the paper made from bamboo is lower than the cost of paper made from imported wood pulp, and it will enable India to produce paper pulp for the whole world." Paper Mills are springing up near centres of bamboo production, *e.g.*, at Chittagong and Rajahmundry. The Carnatic Mills at Rajahmundry have the advantage of the copious water supply of the Godavari, just as the Lucknow Mill uses the water of the Gumti and the Bengal Mills that of the Ganges. Besides this straw may be used in the making of pulp and Bengal with about 2 crore acres under paddy affords an inexhaustible supply of this material.

News-print, paper for newspapers is made with a high per centage of wood pulp and this can never be made in India at a low cost. Besides this it is not economical for India to manufacture paper like Art paper or Tissue paper which requires specialised machinery and the demand for which is not large. Expensive rag papers cannot be made as the quality of India's rags is poor.

Among the factors governing the localisation of paper industry the cost of transport of coal and nearness of the market are more important than the proximity of raw materials. The Paper Mills round about Calcutta have to bring their Sabai grass from a distance of 500 to 800 miles but the coal is not far off and Calcutta is the best market for the disposal of the produce. The opposite tendency is however noticeable in the case of the Punjab Paper Mills at Saharanpore which has been started at a distance of 20 miles from the source of the raw material but is 700 miles away from the coalfields. The main causes which have led to the starting of the industry here are the prospects of utilising electrical energy generated by hydro-electric installations in the neighbourhood and the saving of the enormous transport charges over the carriage of paper all over the Punjab.

Under the Bamboo Paper Industry Act of 1925 protection was given to certain kinds of paper with a view to develop paper manufacture in India. In 1932 the Tariff Board conducted an enquiry into the present condition and future prospects of the industry in India. It was found that the Indian mills could expect to capture an additional market of 20,000 tons a year, but owing to a fall in the prices of paper and pulp the surplus on realised prices over the cost of production was very small, hence the Board recommended that with a view to offer a direct incentive to the manufacture of bamboo pulp, a duty on imported pulp should be levied. **The Government** accepted the recommendations of the Board about the continuance of protective duties and passed legislation accordingly.

The Match as the means for the production of fire is an introduction of quite recent times. Before its advent, people

used flint and tinder, but the convenience and the cheapness of the matchstick have commended it to all and the rich and the poor alike use matches to-day in lighting their fires and in smoking. It has been calculated that 430 matchsticks or about 7 match boxes are consumed annually per head in India and this comes to about 1.2 matches per head per day. India imported in 1921 over Rs. 2 crores worth of matches from Japan and Sweden, in which Japan's share alone exceeded Rs. 185 lakhs. It is a pity that an industry like this has not yet secured a firm foothold in India, though the conditions favourable to it are not wanting here. Cheap labour is available in abundance and the Indian forests are not deficient in suitable timber. The timber most commonly used for matches is the *Simul* (*Bombax Malabaricum*) which grows all over northern and central India. Good boxes can be made out of this, and the sticks are of good quality, but, "the drawbacks of the timber are that it discolours, that it does not allow the sticks being cut uniformly square in section and that the waste in conversion is considerable." Among the other varieties of timber which are also suitable are *Kadamba*, *Gambhar* and *Ghogar* while the Spruce and the Silver Spruce make good matches but cannot be utilised on a large scale till better arrangements for their transport can be made as they are to be found only high up in the Himalayas. Match factories have been started in the Bombay Presidency on a large scale by a Swedish firm, while Bilaspur in C. P. and Dakshinewar, Khulna in Bengal are other centres of the Indian industry; at the last named town timber of the Sunderbuns is used in large quantities. The problem of localisation of the industry is connected with the supply of raw materials, the chief being the timber, and sulphur. It is desirable to start factories close to the source of timber, hence there is ample scope for the starting of match factories in South Kanara, the Bhandara district of C. P., Ganjam and Vizagapatam districts of Madras, Sunderbuns of Bengal, Kamrup and Sibsagar districts of Assam, Kangra Valley of the Punjab, Kheri district of the U. P. and Toungoo district of Burma.

The future of the Indian Match Industry is bright as there is a plentiful supply of wood of good varieties though the trees are scattered and a large number of varieties are mixed together, making large scale enterprise difficult, but this disadvantage is to a large extent counterbalanced by the existence of the facilities of water transport. A great advantage in favour of the Indian matches is that the demand is entirely local, the matches being used within the district, hence they have not to pay the extra charge borne by the imported matches, *a.g.*, the ocean freight, import duty and railway freight from the sea-port to the interior and cost of efficient packing. The comparative lack of success which the industry has experienced so far is mainly due to the wrong selection of site and the wrong processes of manufacture causing much waste of labour, material and time.

The high protective tariff accounts for the fall in the imports of foreign matches. In 1931-32 only 105,000 gross of match boxes were imported as against 397,000 gross in 1931 and 13 2/3 million gross in 1921.

CHAPTER IX.

HOUSE-BUILDING MATERIALS.

The excavations at Kumrahar near Patna indicate that timber was used in making houses in India as early as the fourth century A.D., while the discoveries at Harappa and Mohenjodero have given unmistakable evidence of the perfection which the Indian Art of house-building and town-planning attained in the period of the Indus Civilisation. The earliest man used to take shelter from the elements in the caves of hills and the hollows of large trees but as he increased in numbers and his power of modifying and controlling the forces of Nature developed he began to build homes for himself. The shape of these abodes and the material of which they are made are determined by climatological and geological factors. In the Punjab where the extremes of temperature are experienced, it is necessary to have sufficient protection against the bitter north-winds, hence the houses have as few openings as possible while almost every big house has an underground chamber to which the inmates retire when the scorching west-wind blows in May and June. The roofing of the Punjab houses differs from that of other Provinces, in having a covering of wooden planks over the beams and rafters or where bricks are used a plaster of mud mixed with cowdung is applied over it to prevent it from cracking during the hot months. The houses are mainly made of stones owing to the abundant supply of stones from the hills of the Punjab and Central India. As one proceeds eastwards, brick-built houses become more common, but in the U. P. and in Bihar, the roofing is principally tiled. These tiles are made locally as the soil is suitable for tile-making. In deltaic Bengal mud or brick walls support a low bamboo structure which is covered with straw and other varieties of grass, the central beam at the top forms the watershed down which rain water flows. In lower Bengal and in the districts of Tippera and

Noakhali, which are very often visited by earthquakes and cyclones, the roofing is of tin sheets, and the walls are either made of corrugated iron sheets or of mats fixed over a framework of bamboos. In these areas where the houses are not tin-roofed, but thatched, the roofing has the shape of an inverted boat. The more one proceeds southwards one notices the prominence of the balcony in the South Indian houses where owing to the heat, the people prefer to use the balcony for sitting and sleeping purposes, while they keep their articles in the rooms.

Indian houses are made of bricks, stones and timber. Brick-making is a paying industry and almost every town has its brick fields. This industry is very important in Bengal, which owing to geological conditions, is essentially a country of brick and terracotta buildings. For brick-making, outlying fields, generally close to the Railway line or a station are selected, not often with reference to the quality of the soil but to secure the advantage of cheap transport of coal and of the finished produce. The soil is dug up and wooden moulds of the required size and shape are placed in the kneaded and softened clay and the bricks are prepared. The process of making bricks by hand suffers from the defect that the bricks do not often have sharp and well edged corners. "The Indian climate is a serious consideration. It is impossible to harden a large number of bricks at a time on account of the size of the kiln. The bricks absorb moisture and are badly cracked in the sunshine. On account of this reason, the manufacture of bricks by hand and firing by kilns is gradually decaying." Bricks are not transportable to long distances as they are liable to get damaged in the carts on which they are carried, but the use of motor lorries is gradually widening the market and it is possible that the brick industry will be localised in centres having a suitable soil and facilities for the supply of coal. Brick kilns constructed on the scientific methods of furnace firing, are to be found near the important cities where they are carried on in a big scale. Coal is now generally used as fuel but in districts where wood is cheaper, it is used for

this purpose. The price of bricks largely depends on the price of coal and the distance from the coalfields.

Tiles are also made along with bricks but the introduction of scientific methods has progressed more in the Tile industry than in brick-making as the Tile has a more extensive market due to its being transportable over long distances. Messrs. Burn & Co.'s Tile Works at Raniganj and Paraj are well known for their superior quality, the well burnt tiles are red in colour and give a smart look to the house. Tile works run on modern methods exist also at Jubbulpore, Aligarh, Bareilly, Mangalore and at Feroka in Malabar. Raw material for manufacture in C. P. is derived from the Jubbulpore district and in Madras from the districts of Ganjam, South Kanara, Ramnad, Tinnevely and Trichinopoly.

Indian domestic pottery is mainly unglazed as the pots are thrown away and broken at frequent intervals. The shape and design vary according to local taste and demand and the village potter is given free scope for the display of his genius. The clay used is usually brought from the river banks and pond sides and the appliances employed are entirely primitive. The output of the potter's wheel has a restricted local demand. There is enough scope for the development of the pottery industry on modern lines. Deposits of China Clay occur at Karanpur and Mangalhat in the Sonthal Perganas and at Patharghatta in Bhagalpur and these are used by the Calcutta Pottery Works in Calcutta which is producing besides articles of domestic use, insulators, druggists' and hospital requisites, laboratory porcelain and accessories. Another centre of the pottery industry is Gwalior which uses clay from the State itself and from Jubbulpore. Some places have local peculiarities in deposits of clay and sand which are used in the manufacture of water vessels having the power of rapidly cooling the water, *e.g.*, Siwan, Thanah Bihpur and Cuttack in Bihar, Raniganj in Bengal, Aligarh, Chunar and Bareilly in U. P. and Mangalore in Madras. It has been stated that the glazing and painting of pottery was

not practised among the Hindus, but the Muhammadans introduced this in India and even to-day the Muhammadan Kuzagar purchases from the Hindu potter sundried unglazed vessels which he colours and paints. Clay modelling is a speciality of Krishnagore in Bengal and the modellers of that place have gained an international reputation for the quality of their work.

House-building on steel frames with reinforced concrete walls and roofs has become very common in modern cities, specially for the making of capital structures for office purposes.

Next to bricks, the most important materials in house-building are lime and cement. Lime is derived from three sources:—(1) from limestone which is found at Sutna in Rewah State, at Katni in the Jubbulpore district, in the Khasi Hills, in Sylhet, in the Rhotas Hills, in South Bihar and in Bisra in Central India. (2) Subterranean currents contain a large percentage of the carbonate of lime and as the result of alternate heat and moisture, these cause the formation of Kankar crusts under the soil. The Kankar yields lime and cement and is largely used in North India for road making and is burnt in mud or brick made kilns under slow fire and water is poured all over the burnt mass, which is converted to slaked lime. (3) The third source of lime is shells, which are found abundantly in river beds and which are also used for the manufacture of buttons. Lime making is now a large scale industry and huge furnaces have been constructed at Bisra, Sutna, Katni, Dehri, Sylhet and other places for its manufacture.

Cement is now held in great demand, being used in making many forms of concrete. Houses with concrete walls and floors are not only durable but are absolutely fireproof. It is also used in the making of roads and docks. It is made by crushing limestone and mixing with it shale and other materials. Cement factories have been started in various places where limestone occurs. In Madras Presidency the Portland Cement Company prepares cement from the shale

which are found in the Chingleput district. A large factory has been started at Japla which uses the limestone from the Rhotas Hill in Bihar. The limestone furnishes the calcium carbonate while alumina, silica and iron are derived from the shale. Here the limestone deposit is about 350 feet above the sea level and it is conveyed across the river by a ropeway to the factory where it is mixed with shale which is quarried at Daltonganj, 50 miles away.

Due to the expansion of the cement industry in India, the imports of cement declined from 112,000 tons to 66,000 tons in 1933-34. The bulk of the imports came from the United Kingdom but Japan, Germany and Belgium also supplied large quantities.

For the rich it is a luxury to live in a house made of marble. The use of marble in building construction dates from Moghul times, and the Taj Mahal, the finest specimen of Moghul Architecture, is inlaid with marbles from Chitor while the yellow marble of Jaisalmir has been used profusely in building the tomb of Ghiyas Beg at Agra. Marbles of superior quality are to be found in the quarries of Jodhpur (Makarana Marbles), of Tonkara in Kishengarh, Khawa in Ajmere, Maundha in Jaipur, Dadikar in Alwar and Jubbulpore, C. P. These marbles, owing to their coarseness of grain, milk-white colour and translucence are eminently suitable for architectural works. The stones are first of all blasted, then steel saws are used in cutting the blocks for the required size, which are then raised to the surface by means of hand labour. The use of mechanical lifts and cranes should be introduced to work the deeper veins where stones of a superior quality are likely to be found. Probably the most successful and from the artistic point of view the most delicate use of stone in building decoration has been the construction of the marvelous filigree screens which occupy the place of windows in modern buildings. At Agra white marble is largely used in making screens, tables, toys etc. The total production of marbles in India was valued at Rs. 1½ lakhs in 1923 while the value of imported marbles

exceeds Rs. 3½ lakhs. Stone is brought from Arabia and Mauritius while Carrara marbles of Italy and the Black marbles of Belgium are brought for inlaying work and for statue making.

Glass has a limited use in house-building in India. Silica and the alkalies are the principal raw materials required in the making of glass, but in various parts of the country, inferior varieties of glass are made from the ordinary river sands and the efflorescent alkali salt called Reh. Dinapore near Patna has a large industry of making coarse glass jars while Muzzafarnagar manufactures glass bangles. Quite recently pure sand has been found at Loghra and Borgarh near Allahabad and in Baroda State, but soda is found only in the C. P. Several large glass factories have been started at Allahabad, Ambala, Jubbulpore and Madras, but among the factors which stand in the way of development of this industry are the distance at which the different raw materials are found from one another and from coal. Most of these factories mentioned above have to bring coal and raw material from long distances. In the case of Bombay the sand has to be brought from a distance of 900 miles. The War gave a great impetus to this industry and now we have over 20 factories all over the country. Some of these make glass cakes or blocks out of which the cottage workers in the Firozabad district of the U. P. and Belgaum district of Bombay make bangles. Others are engaged in the manufacture of lampware while Nainī (Allahabad), Lahore and Calcutta make bottles only. None of these factories have yet attempted the making of the sheet and plate glass. This industry is very much hampered not only by the distance of the raw material from coalfields, but from the lack of managers and artisans possessing high technical skill. "The ideal site of a factory should be determined by the nearness of quartz and the fire clay, nearness of fuel and nearness of market," and many of the existing factories have not the combination of these factors. In addition to this there is keen competition from Japan, Czechoslovakia, Belgium, Germany, Austria, Italy and U. S. A. We imported about

Rs. 260 lakhs worth of glass in 1925 but the imports have gradually declined and in 1933-34 they amounted to Rs. 122 lakhs. The imports of Czechoslovakia fell from Rs. 36 lakhs in 1932 to Rs. 20 lakhs in 1933-34 and those from Japan from Rs. 65 lakhs to Rs. 57 lakhs.

CHAPTER X.

TRANSPORT

Man is a born wanderer and the nomadic instinct of the primitive man still persists even to-day and this is evidenced by the constant streams of migration which are flowing out to all corners of the globe. The discovery of new areas offering better prospects for living has attracted the adventurer and the soldier for bringing the area under control, while the colonist appears to put the final touches to the conquest. The movements of mankind resulting in the expansion of the races and the exchange of commodities are the earliest landmarks in the evolution of transportation.

Transportation by moving commodities from the place of manufacture to the points of demand creates place utilities and increase their value. Transport facilities are undoubtedly valuable aids to production as by assembling in one place the different factors of production they enable them to be used to the best advantage and promote a better distribution of the output. "In the case of industries, transport facilities are the auxiliaries to the battle units of the army and the navy. They do not actually fight the battle but they keep up the strength of the fighters and so help to assure victory." In commerce the importance of transportation is great as it is the life-blood of exchange.

The geographical division of labour is promoted by the existence of transport facilities. The old economic system was characterised by the economic self-sufficiency of the different units, while the present stage recognises that the different parts of the world are best fitted to produce different crops or are suited to manufacture particular articles owing to differences of climate and the occurrence of mineral deposits. The growing tendency towards the territorial specialisation of industries is further facilitated by the

development in the transport facilities. It is thus possible now for Manchester to take advantage of its moist climate and manufacture cloth from raw cotton imported from the United States or India and send the finished product to the markets of Asia or Africa.

Man was the earliest beast of burden and remains the same in many places even to-day. In railway stations and in the market-place the cooly or the porter carries maunds and maunds of luggage, while human loads are carried by hillmen over the Himalays to Nepal and to places of pilgrimage like Badrinath, Kailas and Amarnath.

Next to man animals are employed as carriers. Horses are used for this purpose in those places where good grass-land exists, but for hauling purposes the mule is more suitable as it is hardier. The Army has a number of Mule Corps which are engaged in transport and for hauling gunbatteries over the hills. The Yak is quite suitable for the circuitous hill tracks but it is found only in the Himalayan heights. All over the plains, the buffalo and the bullock perform the entire work of the transport of goods in the villages. Crude two-wheeled carts are drawn by them over all sorts of tracts and roads. Buffaloes thrive in areas of heavy rainfall, hence they are to be found in large numbers in rice-growing tracts.

The camel has been aptly described as the ship of the desert and the justice of this remark can only be appreciated if one sees the long trains of camels laden with merchandise traversing the endless sands of the Rajputana deserts or crossing the bleak hills of the North-western Frontier.

The Elephant is not only treasured for ivory but also for its carrying and hauling capacity. It can penetrate into the densest jungles and mount up the steepest hill slopes. The entire work of the removal to the river banks of the famous Burma teak is done by the elephant. It is also employed in removing stones from the quarries in Assam. Elephant catching is now a State monopoly and regular

Kheddah operations are carried on in Upper Burma, Assam, Chittagong, the Orissa States, Central India and Mysore.

The very fact that the earliest civilisations of the world were founded along the banks of the Indus, the Ganges, the Yangstekiang, the Nile, the Rhine and the Euphrates points to the fact that the waterway is earlier than the road. The roadway requires the investment of a large capital in its construction and upkeep, while the waterway is the gift of Nature and the only requirement of capital in this form of transport is for the purchase of the vehicle or the boat. Besides this the boat moves in single units while the railway train requires a number of waggons to compose it and make a trip worth the while. The waterway ensures a further economy, "load for load, boats are cheaper to run than railway waggons. It has been estimated that a railway wagon weighs from $\frac{1}{2}$ to $\frac{1}{4}$ of the weight it can carry, while canal boats weigh only $\frac{1}{5}$ th to $\frac{1}{6}$ th of their total carrying capacity" (*Shah*). The cost of motive power on the waterway is decidedly lower than that on the railroad and this makes it possible to reduce the freights and facilitates the movements of bulkier goods over long distances.

From very early times inland transportation has been well-developed in India. The great riverways of Northern India formed the great arteries of trade and during the rule of the Mauryyas, the regulation of the inland river-borne trade formed a very important part of administration and elaborate rules were framed for that purpose. The river-crafts was divided into various classes according to speed and carrying capacity, *e.g.*, Kshudra (small), Madhyama (middle-sized), Bhima (large) and Chapala (high speed), etc. During the Mahomedan period various ports sprang up along the banks of the North Indian rivers, *e.g.*, Tanda Bacra (well-known for silk manufactures), Sripur and Sonargaon (centres of cotton weaving). Satgaon in Bengal was the great emporium of foreign commerce and here was the terminus of the river traffic. The royal city of Gour developed into a great commercial centre as it was very favourably situated,

being surrounded by the rivers on all sides. There was a paucity of metalled roads but "goods were transported mainly on pack animals to the nearest point at which water carriage became available" (*Moreland*).

The rivers of Northern India are navigable up to long distances owing to the perennial water supply while the rivers of the Deccan have not that advantage as the beds are rocky and the water level goes down considerably during summer. The Indus is navigable by steamers up to Dera Ismail Khan, 800 miles away from the mouth while two of its branches, the Chenab and the Sutlej are navigable for boats throughout the year. The Ganges is navigable for steamers up to Cawnpore and boats can ply in the Jumna throughout the major portion of its course. Steamers can go up to Dibrugarh in the Brahmaputra. The net work of rivers in Eastern Bengal affords excellent facilities for inland transportation and there is very little scope for the extension of railway communication owing to natural difficulties. Short distance canals and channels connect the numerous steamers from Calcutta to Assam over a distance of about 750 miles. A major portion of the jute, paddy and tea crops is borne on them to the manufacturing centre or to the ports for export. Besides these the irrigation canals of Western Bengal, *e.g.*, the Midnapore and Hijli Canals are also important for the purpose of inland navigation. The two principal canals of the United Provinces, the Upper and Lower Ganges Canals are navigable throughout their entire course extending over 275 miles, thus the water-borne traffic of the Ganges can reach places in the region beyond Cawnpore. Though most of the Punjab Canals are navigable over long distances, the Western Jumna Canal is very important as down it are floated large quantities of timber from the hills. The Sirhind Canal affords a through connection *via* the Indus with Karachi. Besides the main rivers of the Deccan which are navigable over the major portion of their plain course during the monsoon months, the most important waterway is the Buckingham Canal which runs parallel to the Corromondal Coast connecting the Kistna with Madras over a distance of

260 milies. The major portion of the cotton and rice produced in the region through which the Godavari and Kistna Canals pass is borne over these canals. In Burma, the Irawaddy is the most important waterway being navigable for more than 500 miles up to Bhamo for all classes of steamers and for smaller crafts up to Myitkiana. The Sittiang and the Salween are also navigable over a considerable part of their course. There is thus ample scope for the extension of irrigation in India and according to Sir Arthur Cotton, "what India wants is water carriage, the railways have completely failed; they cannot carry at the price required; they cannot carry the quantities and they cost the country three millions a year."

It is an undoubted fact that no force has ever exerted a greater and quicker influence in revolutionising the habits and lives of mankind as the Railway. The wonder appears to be very great when one realises that all this transformation has taken place within the last 75 years and the effective size of the Indian continent has been reduced to less than 1/20th of its former dimensions. Not only have the amenities of life been made available to all but our capacities and opportunities of enjoyment have been increased, the volume of trade and manufactures has been vastly multiplied, and the greatest blow has been struck at that great social institution of India, *e.g.*, caste system. The insularity of the rural units has been destroyed and wonderful mobility alike of man and commodities has been brought about equalising the opportunities for the employment of all and standardising value in all directions.

The railway is a great agent for the development of industries and it is a great industry in itself as it requires the investment of large capital. The laying out of the permanent roadway, the building up of the standardised equipment and the construction of the yards, platforms and station buildings, etc., demand that the railway should be carried on a monopolistic basis bringing a fair return on the outlay. A large portion of the capital is invested on the

road-bed irrespective of the amount of traffic and the construction has to be undertaken in anticipation of the development of traffic which may or may not materialise at all. The fixation of rates is very important in railway management as on this depends not only the success of the undertaking but the entire commercial outlook and industrial future of the country. Among the standards for the fixing of rates the principle of charging what the traffic will bear is commonly adopted. The competition with other railways or water transport exercises a great influence in rate-making by fixing a lower limit, but in many cases the railways combine to push up the rates for mutual advantage. Agricultural produce and minerals pay the lowest freights while the class just above this is composed of manufactured goods in their first stage and articles of daily use and raw cotton. The rates on imported articles are low as they help the railways to fill up their waggons on their way back from the ports, but this very often exercises a depressing influence on local industries, *e.g.*, the rate on sugar from Calcutta to Sutna, a distance of 615 miles is lower than that of country-made sugar sent to Sutna from any other place 557 miles away. Then again the rates to the ports are also in many cases much lower than the rates to other inland centres, *e.g.*, the Delhi Cotton Mills have to pay Re. 1-3-2 for cotton from Multan (464 miles) while the rates from Multan to Karachi, at a distance of 607 miles are lower, *e.g.*, Re. 1-1-7. These matters are now engaging the attention of the Government and the entire rates schedule is undergoing a revision.

The history of Indian Railways may be said to date from 16th April, 1853, when the first railway line in India from Bombay to Thanah, a distance of 20 miles was thrown open for traffic. It was speedily realised that both for the purposes of administration as well as for trade, the interior must be opened up by means of railways and the famous Despatch of Lord Dalhousie in 1853 projected the construction of trunk lines. It was natural that the railway connection should start with the three great ports of India,

Calcutta, Madras and Bombay and then gradually extend to the fertile plains beyond. The E. I. Railway took up the construction of the railway system in Northern India and connected the port of Calcutta with the coalfields at Raniganj at a distance of 120 miles. This line was gradually pushed to the north-west parallel to the right bank of the Ganges through the fertile plains of Bihar and U. P. thus offering very effective competition with the inland river-route. In 1906 a shorter route has been opened up connecting Asansole with Mughalsarai and a loop line has been constructed to connect Mokameh with Khanna, and in recent years has been built a shorter route connecting Burdwan with Howrah. The E. I. Railway is connected with the E. B. Railway at Naihati, with the B. N. Railway at Asansole and Gomoh, with the B. N. W. Railway at Mokameh, Patna and Bhagalpur, with G. I. P. Railway at Cawnpore and Jubbulpur, with the N. W. Railway at Delhi. It was originally started with a Government Guarantee but in 1921 it was taken over by the Government and as a State Railway it has now been amalgamated with the O. R. Railway. Thus it is by far the most extensive and most important railway system of India connecting Calcutta with the extensive plains of the Gangetic valley and with the mineral deposits of Chota Nagpur. It carries about two-thirds of the coal output of the Chota Nagpur field. It carries besides these oil-seeds, jute, metals, opium, salt, sugar and tobacco.

The G. I. P. Railway is one of our oldest lines and it connects Bombay with the Madras and S. M. Railway at Raichur, with the E. I. Railway at Jubbulpore, with the B. N. Railway at Nagpur and with N. W. Railway at Delhi. This line had to surmount many natural difficulties and it passes through the sparsely populated parts of Central India, but as it affords direct connection with Bombay and the north of India it attracts heavy passenger as well as goods traffic. It serves the cotton areas of Berar, Khandesh and Deccan and carries more cotton than any other line. It also carries large quantities of oil-seeds, grains, metals, sugar and timber. The G. I. P. Railway has electrified the main line

section between Kalyan and Poona. There are three tunnels in all aggregating 4,598 feet, the longest of these being 3100 feet. Electrification has reduced the period of journey by about three hours.

The Madras and S. M. Railway connects Madras with the B. N. Railway at Waltair, with the G. I. P. Railway and it serves the eastern and central districts of the Madras Presidency while one line goes to the west coast to Cannanore and Bangalore. It passes through a thickly populated and fertile area with a large traffic in grain, cotton, oil-seeds, salt sugar, tobacco, timber and hides; and it serves as the connecting links between Madras and Calcutta on one side and Bombay on the other.

The E. B. Railway serves the northern and eastern districts of Bengal and connects Calcutta with the jute, rice, tobacco, and tea-growing areas. The principal handicap under which this railway has to work is the obstacle afforded by the Ganges and its tributaries, making through communication over long distances impossible. The Ganges bridge at Sara, however, has connected Calcutta with Darjeeling, with the tobacco-growing district of Rungpur, the Jute areas of the North and the Tea producing districts of Assam, but elsewhere the service is maintained in connection with the Inland Steam Navigation Company's steamers. This railway is connected with the B. N. W. Railway at Katihar and takes over a large portion of the oil-seeds and grain traffic from the latter line.

The B. N. W. Railway with the R. K. Railway has cast a network of lines on the other side of the Ganges extending from eastern Punjab to Bengal having connection with E. I. Railway at various places by means of steamers and waggon-ferries, further it is connected with the metre gauge section of the G. I. P. Railway at Cawnpore affording a direct connection with Rajputania. It has a large passenger traffic as well as a heavy traffic in rice, grain, raw sugar, oil-seeds and hides. As it passes through an almost unbroken plain the cost of construction as well as the working cost are

very low and it is one of the most successful undertakings in India.

The B. N. Railway connects Calcutta with Nagpur and Madras and it furnishes the shortest route to Bombay. The southern section of the railway runs parallel to the Eastern Ghats and joins the M. & S. M. Railway at Waltair. The country through which it passes is intersected by the great rivers of the Deccan and mountain ranges, hence the cost of construction and maintenance is very high. It has access to the coalfields of Jherriah and by an agreement with the E. I. Railway in 1905 the rates for carrying coal over the routes have been equalised and this, along with the development of iron mining at Garumahisani has contributed to the prosperity of this railway company.

The N. W. Railway is now perhaps the largest railway system in India under one administration with a mileage exceeding 6300 miles. It serves mainly the Punjab with which it connects Sind and the port of Karachi. The development of the canal colony area has increased its earnings and it carries the largest amount of wheat traffic in India. As it serves the Salt Ranges of the Punjab it has a considerable traffic in salt. About one-half of the entire system was, however, constructed for military purposes, hence the cost of construction of the line over tracts of deserts and mountainous country was necessarily high. It is connected with the Khyber Railway, which has recently been opened. This Railway has taken the line right over the Khyber Pass, one of the oldest trade routes to India across the Western Frontier and has carried railway facilities to the very doors of Afganistan. The line has a length of 27 miles with 32 tunnels.

In addition to these, many Indian States have their own railways which are worked either by the State Departments or through the agents of the Railway Companies with whose lines these railways are connected as feeders. The most important of these lines are the Nizam's Guaranteed State Railway and the Mysore State Railway, as they have helped

to open up the interior of the States and have provided short routes connecting Madras with Delhi and other cities of Northern India by a route 200 miles shorter. The light railways in various parts of the country have a very important place in the railway system as they are very efficient as feeder lines and have in many cases prepared the ground for the construction of lines with standard gauge.

India has at present a total mileage of 42,913 miles composed of Broad gauge 21, 106, Metre gauge 17,529 and Narrow gauge 4178 as compared to 232,000 miles in U. S. A. The total capital invested in Indian railways exceeds Rs. 7,88,66,00,000 while the percentage of net earnings on the total capital outlay is about $5\frac{1}{2}$ per cent. The metre gauge line of 3 ft. 3 $\frac{3}{8}$ inches is as important as the standard gauge. The entire area to the north of the Ganges is served by an extensive system of metre gauge lines which are connected with the Rajputana and Kathiawar systems, and in the south, the South India and South Mahratha Railways carry the metre gauge down to the southernmost point of India. Thus it is now possible to have through communication from Sadiya, the easternmost point of India on the A. B. Railway with Porebunder in Kathiawar or Hyderabad in Sind, in fact over the entire breadth of India, while if the gap between Khandwa in C. P. and Manmad in the Bombay Presidency is filled up through metre gauge communication can be established between Bhatinda in the Punjab and Trivandrum in the extreme south, thus offering an alternative route to the broad gauge lines. Among these lines under construction the most important is the Raipur, Vizianagram Railway, 261 miles long, which will not only open up the south-easternmost portion of C. P. but will give the C. P. a direct connection over the shortest route with the Vizianagram harbour thus affording easy facilities for the export of manganese and other minerals. The G. I. P. Railway deserves the credit of being the first railway administration in India which has successfully inaugurated the electrification of the line. Bombay has been connected with the

suburban stations by the electric Railway and this has not only reduced the cost of working but has brought about a better distribution of the population by relieving the congestion in that city.

A study of the railway map of India shows that the countries along both the banks of the Ganges and in eastern Punjab and Kathiawar are intersected by a close network of railways while large tracts in Sindh, Central India, C. P., the western coast of Bombay Presidency and in the Deccan tableland yet remain to be opened up. The concentration of railways in Gangetic Valley is not only due to the fertility of the soil bringing about a heavy density of population, but to the occurrence of coal and iron and other valuable minerals. The level nature of the country presents no serious physical obstruction to rail expansion which is not the case in the south where there is an additional deficiency in sparseness of the population and the absence of important industries.

These roads, of course, would not answer to the description of roads in the modern sense, which are "embanked a nation of small traders and our hauls and our loads must necessarily be short, hence the average cost of working the railways must be higher than in the West. But our railways have served three important purposes, "They carry, in times of need food from prosperous districts to famine stricken provinces; they give the impulse to production and trade when railways carry to the sea-ports surplus products that would otherwise have no market, and they make an enormous addition to the military strength of the country, when troops and materials can be moved to the Frontiers or any scene of disturbance, at the rate of 400 miles, instead of 10 miles a day and at one-sixth of the old cost."* The railways have been followed in all productive areas by the springing up of central markets where the producer is brought face to face with the dealer and broker and he is free to bargain on his own terms. "The villager is brought into touch with the

*McGeorge—Ways and Works in India.

outer world, he learns the ways of trade and reaps the profits of bountiful harvests." A greater benefit than all these perhaps is the gradual development of a better understanding among the people of the different provinces of India who are coming into contact with one another in the course of their travels.

Road-making is an ancient art in India. The Ramayana gives elaborate descriptions of all the processes of road construction including the felling of trees, clearing of thickets, levelling of the roadbed and bridging of rivers and water-courses. The Mauryan roads were planted with trees and rest-houses and wells were dug at fixed intervals. The internal trade of the country was carried over the rivers as well as over the roads and several important trade routes connected the capital Pataliputra with the North-western Frontier and the ports on the Western coast. One road led from Attock to Taxila, the seat of the famous University, then to Nicaea (Jhelum) and Cakala (Sialkot) and across the *Ravi* and the *Beas* and along the banks of the *Jumna* and the *Ganges* to Pataliputra while another route started from Broach on the Western seaboard to Ujjain, then through Besnagar and Bharhut, it met the great northern road at Kausambhi and led ultimately to Pataliputra through Benares.

These roads, of course, would not answer to the description of roads in modern sense, which are "embanked lines of way, well drained, with easy inclinations and hard smooth surfaces, allowing the use of wheeled traffic with a minimum of resistance and carried by means of raised bridges over the watercourses of the country." The great road from Bengal to Peshawar constructed by Sher Shah marked a distinct improvement over the earlier roads. The Mughal roads were provided with rest houses and tall brick pillars indicating distances while suitable arrangements had been made for the protection of the travellers.

India has four great trunk roads running diagonally across the country with which all the important subsidiary

roads are linked. The Grand Trunk Road stretches right across Northern India connecting Bengal with the north-west frontier, the other three roads connect Calcutta with Madras, Madras with Bombay and Bombay with Delhi. The Madras-Calcutta road is not bridged throughout its entire length and where it enters Orissa, it is practically unbridgable. There is no road bridge on the Sone, hence travellers by the Grand Trunk Road have to entertain at Sone East Bank and Dehri. Now that the extensions of the Koilwar Bridge are complete and the Arrah-Sassaram Road has been improved, the present difficulties of the Grand Trunk Road have been removed.

Road-making is to a large extent governed by the physical conditions of the country and in this respect the roads of Northern India which pass through unbroken plains have a distinct advantage over the roads of hilly Deccan. The roads leading to South India have either followed the east coast or have passed through the gaps in the Vindhyas. Military considerations have also played an important part in determining the nature of the roads and their direction. During the Company rule, the want of good roads was considered an advantage as it taught Indian armies how to do without them, but after the Sepoy Mutiny, the Military Department planned and constructed an elaborate system of metalled roads, connecting Calcutta with the important Cantonment stations in Northern India. The coming of the railways effected another change in road policy as roads began to be constructed to serve as feeders of the railways. Uptill now the only commercial use of roads consisted in assisting in the removal of the surplus produce of the villages and as the harvest coincided with the dry season when the rivers were fordable, the necessity for bridging was not felt, but with the coming of the railway and the growth of central markets, roads for all weather purposes became a necessity. Hence roads began to be bridged and they converged towards the railway stations. Another development is in progress at the present time, as with the coming of motor transport the road in addition to its function as feeders has begun to

compete with the railway for short distance traffic for medium loads. The motor traffic has made road-making more expensive as the roads have to be metalled and made passable throughout the year. The average Indian district to-day has more than one metalled road running through it linking it up with its neighbours on either side but few districts have arterial metalled roads.

Total mileage of roads in British India per 100 sq. miles area.

| | | | | |
|------------------|----|----|----|----|
| Madras | .. | .. | .. | 19 |
| Bombay | .. | .. | .. | 21 |
| United Provinces | .. | .. | .. | 33 |
| Bihar and Orissa | .. | .. | .. | 35 |
| Punjab | .. | .. | .. | 23 |

As will appear from the table given above Madras, the United Provinces, Bombay and Bihar have the largest proportion of metalled roads owing to the level nature of the country, lack of railway communication and the availability of local supplies of road materials, while in Bengal it is expensive owing to the necessity of constructing embankments, the large number of rivers and streams which have to be bridged over and the inferior nature of metalling.

It cannot be denied that with the development of motor transport, the road has recovered some of its pristine importance. Compared with the railway road-making is less expensive, as a road for medium traffic can be constructed on any soil and it does not require the locking up of a huge capital in permanent fixtures like stations, platforms, yards, etc., and it is not very difficult to alter the route if the traffic does not come up to expectations. The motor traffic suits the petty trader as it conveys even small loads from point to point without breaking the bulk and the vehicle runs according to the convenience of the trader. The cost of transport of "a Ford Motor lorry per ton mile is 3.87 annas or 1.28 pies per maund per mile. This is indeed far in excess of the minimum rates allowed on the railway." There is

* K. T. Shah—Trade, Tariff and Transport, p. 403.

ample scope for the development of motor transport in the mountainous regions and forest areas where railway communication is either impossible or expensive, *e.g.*, the lower Himalayan ranges, Assam hills, etc. Over short distances, the motor has begun to offer very effective competition, specially where two important cities either in the plains or in the hills are connected by motor and railway routes, *e.g.*, the traffic between Kalka and Simla, Siliguri and Darjeeling, Gaya and Ranchi, Agra and Muttra, etc. That motor transport has come to stay is evidenced by the meteoric increase in the import of motor cars which rose from 1562 in 1927 valued at Rs. 72,16,000 to 21,343 in 1926 valued at Rs. 5,09,16,000. Owing to the general business depression the imports of motor cars in 1931-32 fell to 7220 valued at Rs. 1,48 lakhs. The proportion of British cars to the total trade rose from 23 per cent. in 1930-32 to 30 per cent. in 1931-32 though the number of imported cars fell from 2885 valued at Rs. 71 lakhs to 2178 valued at Rs. 50½ lakhs. The number of cars imported from the United States fell from 5.98 valued at Rs. 100 lakhs to 3368 valued at Rs. 65 lakhs and there was a proportionate decline in our imports from Canada.

NUMBER OF MOTOR VEHICLES REGISTERED IN INDIA.

| | (Up to March 1932.) Total Number. | Pcg. of Lorries and Buses. |
|-------------------|---|-------------------------------|
| Bengal | .. 24,400 | 9.0 |
| Bombay Presidency | .. 33,700 | 4.1 |
| Madras Presidency | .. 33,700 | 24.2 |
| United Provinces | .. 19,800 | 26.3 |
| Punjab | .. 24,700 | 33.0 |
| Bihar and Orissa | .. 14,600 | 14.2 |
| C. P. | .. 6,100 | 16.1 |

With a view to improve road facilities, the Government have levied a surcharge of 2 annas per gallon on the import and excise duties on motor spirit. This along with the income from motor tax is being administered by the Road Boards and a concerted effort is being made to develop roads,

not as substitute for railways but as feeders and inter-provincial roads are being improved.

Another formidable rival of the Railway is the Aeroplane. It has the great advantage of speed and it entails less cost than the railway in the preparation of a roadway, though "the first essential for the successful operation of air transport lies not in the air, but on the ground." The ground organisation includes the construction of aerodromes and light houses, laying out of landing grounds and the inauguration of wireless and meteorological services. The direction of the air routes depends to a great extent on the availability of these ground facilities as well as on the physical configuration of the area over which they pass. Aircraft can cross mountain chains of medium height but it is difficult for goods-carrying craft to rise over altitudes exceeding 14000 feet. This explains the direction of the most important Trunk routes of Europe which run from West to East, north of the Alpine system and pass over the most populous cities and districts of Central and Eastern Plain. The other trans-continental route from London to India and Australia *via* Brussels, Munich, Belgrade follows the Danubian valley and crosses the Carpathians and the Balkans. The London-Calcutta Air Mail route follows the coastline of Baluchistan and Persia, flies up the Euphrates valley to Alexandria from where it proceeds to Athens and thence to Brindisi, and Paris. The rest of the route passes over France and Germany to London. At present the service is carrying Mails and a limited number of passengers and it has reduced the time taken by the ordinary Mails to reach London by twelve days. Karachi was the terminus at first, but the service was gradually extended to Delhi *via* Jodhpur and later on to Calcutta, and it is proposed to extend it to Rangoon and later on the Melbourne in Australia. Messrs. Tata Sons & Co., of Bombay have undertaken to run a Karachi-Bombay-Madras air line and a Calcutta-Dacca service is also under contemplation. Apart from these services, permission has been given for the operation across India of regular fortnightly air services by a Dutch

Company from Amsterdam to Batavia and by a French Company from Paris to Saigon. Civil aviation is being controlled by the Director of Civil Aviation. There are eight Aero clubs at Karachi, Bombay, Delhi, Calcutta; Lahore; and Madras and pilots receive their training in these clubs. Improvement have been made in the landing grounds at Chittagong, Sandoway, Bassein, and Mingaladon (Rangoon) and ground organisation facilities have been provided at Hyderabad, Uterlae, Jodhpur, Badpal; Delhi; Allahabad; Gaya, Akyab and Bombay. The Government Metereological Department is giving material assistance to aerial navigation by studying air conditions and supplying air information by wireless to the air stations on the Persian Coast. Metereological stations have been established at Quetta, Peshawar, Karachi, Calcutta and Poona while the Upper Air Observatory at Agra is in charge of maintaining and supervising the work of pilot ballon observatories in India. The flights of Sir Ross Smith, Alan Cobham, Miss Amy Johnson, Lord Clydesdale and others have demonstrated beyond doubt the vast possibilities of aviation. Air craft is also being employed for the prevention of smuggling, for combating with malarial mosquitoes and in the destruction of Boll-weevil in the cotton fields of the United States. Aerial photographic and survey work of great value has recently been done by the Indian Air Survey and Transport Limited. "Air transport is no longer the dangerous and haphazard thing which many still regard it. It has come to take its place in the scheme of evolution which is unfolding so rapidly, aided by modern science. It has come to bridge time for matter in the same way that electricity made it possible to bridge time for mind."

CHAPTER XI.

FOREIGN TRADE.

International trade is really another form of home trade in which one person supplies an article for which another person may have a need in exchange for a commodity which he requires himself. This exchange is ultimately on the basis of barter in which the wants of one party are satisfied from the surplus of another, and mutual satisfaction results from the transaction. The real service which trade confers is by the creation of utilities of time and place and it is thus as important as manufacture or agriculture. It arises out of the real surplus of production over consumption and this surplus is utilised in making good the deficiency in production elsewhere. This trade further develops the specialisation of industry and facilitates the division of labour all over the world giving scope to all localities and people to develop those industries in the production of which there is a genuine local advantage. Foreign trade differs from home trade in one important particular, *i.e.*, it is carried over very long distances by sea or land across many countries with a diversity of laws and monetary standards. The result of all these is a complication which prevents very often a free flow of trade. The principal advantage which foreign trade affords is the increased utility which arises out of the acquisition of new markets and the fullest effectiveness which the various factors of production can attain, while the social and moral effects of trade are no less important and far reaching.

The causes which give rise to foreign trade are partly economic and partly geographical. It is well-known that inspite of the development of the means of communication labour and capital are yet immobile, *i.e.*, there is positive disinclination on the part of labour and capital to migrate to other countries if the local conditions are not suitable for

their proper utilisation, and this brings about a perpetuation of the inequalities in the industrial world which is conducive to trade. Some countries, due to various physical factors as the existence of suitable minerals or soil conditions favourable to the growth of various crops or due to racial temperament favourable to industry or to the existence of political institutions conducive to the development of those manufactures, enjoy a natural advantage in comparative costs in the production of particular articles, hence they have a considerable trade in them.

One of the most important factors which determines the nature and extent of the foreign trade of a country is the stage of economic progress in which it is at a particular time. A country which is in the agricultural stage shows a preponderance of raw materials in her export trade and manufactured goods figure prominently among her imports, while a country which has been industrialised like England imports her foodstuffs and raw materials in exchange for manufactured goods. India is in a stage of economic transition, while agriculture is still the principal industry, agriculture itself has become commercialised and a considerable amount of territorial specialisation has become noticeable. The rapid development of various types of industries using local raw materials is another indication of the transition. The import of manufactured goods in India has fallen from 81.9 per cent. in 1920 to 71 per cent. in 1921 while the export of raw materials has also declined from 51.7 per cent. in 1919 to 48.2 per cent. in 1921 and this is accompanied by an increase in the import of mill machinery, and electrical goods which point to the development of manufactures. The difference in natural aptitudes either due to racial factors or culture is another important factor in building up and directing the national trade, *e.g.*, the Marwari or the Parsee has a natural aptitude for trade, the artistic skill of the *shawl* weaver of Kashmir has hardly been surpassed anywhere else and the Burmese wood carver is still unrivalled in his arts. Trade policy has a large influence in developing commerce and fixing its direction. The navigation laws in

the U. S. A. and the policy of free trade in England have contributed not a little to the volume of their trade, while the policy of discriminative protection which has just been inaugurated in India is gradually making its influence felt.

Among the geographical factors the most important is the endowment of natural resources of a country, which has given support to the theory that nature determines one country to be agricultural while another country has by its very natural gifts an industrial destiny. The fertility of the soil of the Gangetic Valley and the east coast strip accounts for the preponderance of raw materials in the exports of those regions, while Burma has a large volume of trade in rice, timber and petroleum owing to the rich soil of the Irrawaddy Valley, the oil fields and the extensive forest regions of Upper Burma. Then the contour of a country is also helpful in promoting trade and the relatively unbroken coast line of India accounts for the lack of good ports and harbours, and has stood in the way of the people becoming sea-faring. The Bombay coast is rocky while the Coromondal coast is too shallow for large steamers. Climatic influences are important in determining the period and nature of trade. The transfrontier trade of India is held up during the winter owing to snow-fall in the Passes, and the monsoon period is rather risky for shipping. Trade in fruits and edibles flourishes only during that period of the year when the climatic conditions are favourable for their ripening. The great volume of inland trade in fruits, *e.g.*, mangoes, oranges and grapes during summer is a case in point.

Historical records point to the existence of a large foreign trade in India from the Buddhist period. The exports consisted mostly in articles in which India excelled, *e.g.*, silks, spices, muslin, finer sorts of cloth; cutlery; brocade; perfumes, ivory and ivory work and gold while metals like copper, tin, lead, coral, crude glass, porcelain and horses made up the list of imports. Thus the exports were mainly in manufactured goods which indicates a high stage in the development of industries. The main avenues of the sea-

borne trade were the ports of Barbarican at the mouth of the Indus, Barugaza (Broach), Nelkunda (Nelkantha) on the Malabar coast and Saptagram in Bengal.

With the development of ship-building, both in peace and war, there was a great expansion in the foreign trade during the Muhammedan period. The imports consisted of silk, glassware, woollen goods, metals, horses, pearls and slaves while in the export list were included manufactures, *viz.*, iron implements, silk goods, woollen goods, ivory work, leather goods, opium, and spices, elephants; sandalwood; etc. The principal ports of this period were Diu, Cambay, Surat, Broach, Goa, Mangalore and Calicut on the western coast, and Negapatam, Maslipatam and Madras on the Coromondal coast, while the Bengal ports were Hooghly and Satgaon. The Deccan had a monopoly of the import trade in horses from Arabia, and according to Dr. K. T. Shah's estimate the imports exceeded 100,000 horses per annum.

The chief characteristic features of India's foreign trade are—(1) the excess of exports over imports, (2) the preponderance of manufactured goods in the imports and of raw materials in the exports, (3) the large entrepot trade.

The entrepot trade is of great magnitude, amounting to Rs. 14,06,34,125 and this includes articles imported for re-export to the countries bordering India. This trade is mainly conditioned by the geographical advantage which India enjoys in having a large sea-board but the absence of a quicker means of transport with our neighbours stands in the way of a quicker expansion of this trade. Nepal, Afghanistan, Western China, Tibet and the Shan States may be said to form the natural hinterland of India as these countries have not the facilities of a direct sea trade, and the Indian sea ports afford the nearest avenue for the supply of foreign manufactures and other goods for them. This frontier trade mostly consists in cotton twist, yarn and piece goods, metals and manufactured metal goods, etc.

EXPORTS TO THE FRONTIER, (in Rs. 1,000).

| | | | |
|-----------------------|----|----|-------------|
| Cotton Piece-goods | .. | .. | Rs. 3,79,96 |
| Cotton Twist and Yarn | .. | .. | „ 1,16,36 |
| Cotton Raw | .. | .. | „ 36,96 |
| Metals and Mfg. goods | .. | .. | „ 2,24,94 |
| Grain and Pulse | .. | .. | „ 1,29,20 |
| Provision | .. | .. | „ 58,15 |
| Sugar | .. | .. | „ 96,45 |
| Spices | .. | .. | „ 34,44 |
| Salt | .. | .. | „ 30,89 |
| Tea | .. | .. | „ 14,31 |
| Oils | .. | .. | „ 74,14 |
| Railway materials | .. | .. | „ 64,46 |
| Dyeing materials | .. | .. | „ 26,93 |
| Animals | .. | .. | „ 19,80 |
| Tobacco | .. | .. | „ 19,37 |
| Leather | .. | .. | „ 18,54 |

This trade is carried over the land frontier through the ancient trade routes of the North-west along the Khyber Pass, the Khuram Valley and the Gumal Pass. The Tibetan trade route is blocked during the winter, and it is almost impossible to haul up heavy commodities. With the opening of railways in Nepal connecting with the Indian Railway system at Raxoul and the construction of a cable way over two ranges of hills there has been a considerable expansion of trade. With the further development of railway communication with Afghanistan, Nepal and the Shan States, the entrepot trade is likely to expand as these countries are not in a position to produce many of the articles which we export to them.

The excess of exports over imports varied from Rs. 109 crores in 1925 to Rs. 53 crores in 1929 and to 63 crores in 1933-34 and it includes the payment which India has to make for the interest on foreign capital invested here, for the freight charge of goods carried in foreign ships, for the pension and leave allowances of European employees, all of which are usually grouped under "Invisible imports."

Import of treasure on private account forms a very prominent feature of India's imports. It rose to Rs. 63,04,40,000 in 1922 from Rs. 26,05,48,000 in 1917 but fell to Rs. 41,31,46 in 1926.

The total imports of India were Rs. 207,97,23,940 in 1919, Rs. 266,34,63,422 in 1921 and Rs. 2,82,44,49,000 in 1926 and Rs. 115,38,61,000 in 1933-34.

VALUE OF TOTAL IMPORTS IN 1919 (Rs. 208,00,00,000).

| | | |
|-------------------|----|------------------|
| I. Food and drink | .. | Rs. 41,00,00,000 |
| II. Raw materials | .. | „ 17,34,00,000 |
| III. Manufactures | .. | „ 145,40,00,000 |
| IV. Miscellaneous | .. | „ 4,00,00,000 |

VALUE OF TOTAL IMPORTS IN 1921 (Rs. 266,40,00,000).

| | | |
|-------------------|----|------------------|
| I. Food and drink | .. | Rs. 50,00,00,000 |
| II. Raw materials | .. | „ 22,00,00,000 |
| III. Manufactures | .. | „ 190,40,00,000 |
| IV. Miscellaneous | .. | „ 4,30,00,000 |

The most important place in the import list is occupied by the manufactured goods which are about $\frac{1}{3}$ of our entire import trade. On an analysis of the import trade, the following articles appear to be prominent :—

| | 1927-28 | 1931-32 | Increase or Decrease |
|----------------------------|----------|----------|----------------------------|
| (In Thousand of Rupees). | | | |
| Cotton and Cotton goods .. | 71,90,16 | 26,18,81 | —45,81,35 |
| Machinery and Mill-work .. | 15,93,75 | 10,92,34 | —5,01,41 |
| Oils .. | 11,08,68 | 9,72,26 | —1,36,42 |
| Sugar .. | 14,90,55 | 6,16,53 | —8,74,02 |
| Vehicles .. | 7,69,37 | 4,48,47 | —3,20,90 |
| Silk raw & manufactures .. | 5,50,78 | 2,73,56 | —2,77,22 |
| Dyes .. | 2,64,55 | 2,67,65 | +3,10 |
| Hardware .. | 5,24,42 | 2,60,91 | —2,63,51 |

| | | | |
|-------------------------------------|---------|---------|----------|
| Chemicals .. | 2,54,95 | 2,56,97 | —7,98 |
| Paper and Paste-board .. | 3,00,62 | 2,50,24 | —50,38 |
| Rubber .. | 2,71,67 | 2,22,28 | —49,39 |
| Wool raw & mfgs. .. | 5,36,82 | 1,62,06 | —3,74,76 |
| Tobacco .. | 2,91,32 | 94,34 | —1,96,98 |
| Soap .. | 1,61,37 | 88,72 | —72,65 |
| Building & engineering materials .. | 1,28,80 | 83,78 | —45,02 |
| Umbrellas .. | 62,38 | 30,16 | —32,22 |
| Cutlery .. | 38,50 | 20,69 | 17,81 |
| Matches .. | 39,37 | 1,05 | —38,32 |
| Coal and Coke .. | 62,49 | 14,28 | —48,21 |

This list gives us an idea of the gradual industrialisation of the country. Our import of coal points to the unequal distribution of our coal deposits and to the insufficiency of the supply for industrial purposes. Bombay is situated far from the coalfields, hence she has to import coal from Natal and Wales. The large quantity of chemicals indicates the deficiency of India in the sphere of heavy chemicals which are of the greatest importance for all industries.

The remarkable increase in the imports of iron and steel, railway plant, machinery and mill-work during the last decade gives striking testimony to the rapid development of our industries. Most important among these imports are cotton and jute, mill machinery, electrical appliances, prime movers and boilers, locomotives, carriages and waggons and iron and steel sheets and plates (galvanised and tinned) and tubes and pipes. Those imports will continue to be a principal feature of our imports till the infant steel industry is established on a firm footing and the manufacture of mill machinery in India can be undertaken.

The heavy imports of cotton yarn and manufactured cotton goods are due to our inability to grow longer stapled yarn of the quality grown in Egypt and America, hence yarn of higher counts and finer cotton have to be imported

from England. The piece-goods trade is mainly in the superior varieties.

The decline in the imports of matches points to the development of the match industry in India and to the check which has been effected in the imports due to fiscal measures.

Among the principal causes which have contributed to the development of the export trade of India may be mentioned the development of communications, within the country and the opening of the Suez Canal which has shortened the journey to Europe considerably. The agricultural policy of the Government and the improvement in the facilities of irrigation have materially helped in the introduction of better varieties of money crops thereby creating a surplus in the production of raw materials for export. Considering the fact that natural factors have made India pre-eminently an agricultural country, it is no wonder that raw materials form the bulk of her exports. Of the total exports in 1913 amounting to £144.6 millions raw materials accounted for £74 millions or even 50 per cent., food-stuffs £37.2 millions or 25 per cent., manufactured articles £30 millions or 20 per cent.

VALUE OF EXPORT TRADE OF INDIA (in Rs. 1,000).

| | 1917 | 1931-32 | 1933-34 |
|---------------------|----------|----------|----------|
| | Rs. | Rs. | Rs. |
| Raw Cotton .. | 42,69,86 | 23,78,19 | 26,93,27 |
| Cotton Twist & Mfg. | 13,00,00 | 4,81,83 | 2,72,63 |
| Grains .. | 20,81,00 | 20,37,18 | 11,74,79 |
| Raw Hides .. | 8,00,00 | 3,65,71 | 4,25,33 |
| Tanned Hides .. | 6,00,00 | 5,35,20 | 5,28,98 |
| Jute Raw .. | 6,45,00 | 11,18,81 | 10,93,27 |
| Jute Manufactures | 42,84,00 | 21,92,42 | 21,37,49 |
| Lac .. | 3,77,00 | 1,83,94 | 2,46,44 |
| Mica .. | 86,00 | 39,36 | 44,74 |
| Tea .. | 17,67,30 | 19,43,74 | 19,84,62 |
| Raw Wool .. | 4,07,48 | 3,36,73 | 2,72,48 |

Among the raw materials, cotton and jute predominate. The black cotton soil of the Deccan and the moist fertile plains of riverine Bengal have made them admirably suitable for the cultivation of cotton and jute respectively. The short stapled Indian cotton is used in Europe when the price of medium American cotton goes up while in Japan she has a ready customer for her cotton. In jute, India is in the position of a monopolist and the acreage under jute expands or contracts according to the rise or fall in the price of jute. The exports of oil seeds exceeds in value Rs. 13 crores, and the most important of these are groundnuts which account for one-third, and Linseed, Rape and Castor. Madras and Bombay have an extensive cultivation of groundnut. Linseed was at one time India's monopoly but now Argentine has taken the lead in the world's market. India exports linseed but has to import linseed oil.

EXPORT OF OILSEEDS.

| | | | | | |
|---------|----|----|----|-----|--------------|
| 1917 | .. | .. | .. | Rs. | 8,22,19,000 |
| 1922 | .. | .. | .. | „ | 27,35,38,000 |
| 1924 | .. | .. | .. | „ | 33,63,68,000 |
| 1925 | .. | .. | .. | „ | 29,63,68,000 |
| 1926 | .. | .. | .. | „ | 19,08,77,000 |
| 1931-32 | .. | .. | .. | „ | 14,59,00,000 |
| 1933-34 | .. | .. | .. | „ | 13,66,15,000 |

ANALYSIS OF EXPORT OF OILSEEDS.

(1,000 Tons).

| | Pre-war Average. | 1933-34. |
|-----------|------------------|-------------|
| Linseed | 379 | 379 |
| Groundnut | 212 | 547 |
| Rape | 273 | 73 |
| Cotton | 240 | 6 |
| Copra | 31 | .. |
| Castor | 114 | 82 |
| Sesamum | 119 | 15 |
| Others | 85 | 22 |
| | <hr/> 1,453 | <hr/> 1,124 |

The export of raw hides received a check when the Great War broke out and this developed the tanning industry in India, hence we find that to-day India exports almost an equal amount of raw and tanned hides.

Among food-stuffs, rice and wheat are most important. About three-fourths of the exported rice comes from Lower Burma, which however contracts when there is a serious failure of the harvest anywhere in India. The extension of rice cultivation in Burma has been arrested by the rapid growth of population which has reduced the surplus available for export by increasing the local demand.

The wheat exports depend on the success or failure of other food crops and also on the prices ruling in the European market. The variations in the wheat exports can be noticed in the table given below:—

| | | | | | |
|------|----|----|----|-----|--------------|
| 1917 | .. | .. | .. | Rs. | 19,00,28,000 |
| 1918 | .. | .. | .. | „ | 6,75,31,000 |
| 1919 | .. | .. | .. | „ | 20,37,000 |
| 1920 | .. | .. | .. | „ | 4,10,03,000 |
| 1921 | .. | .. | .. | „ | 1,46,83,000 |
| 1923 | .. | .. | .. | „ | 9,11,81,000 |
| 1924 | .. | .. | .. | „ | 17,19,50,000 |
| 1926 | .. | .. | .. | „ | 2,71,07,000 |

Thus in good years the percentage of exports to the total produce is about 10 while in a famine year, it may drop to 2.

Tea represents about 8 per cent. of the total export trade. India is a strong rival of China in the production of Tea and she produces Black, Green and Brick Tea. With the opening of railway communication in the Darjeeling and Assam tea areas the export trade has been considerably developed. The main exporting season is from July to December.

Among India's export of manufactured goods, Jute manufactures are by far the most important. The Bengal Mills manufacture both gunny bags and hessian cloth. The

exports steadily increased in value from Rs. 42,84,31,000 in 1917 to Rs. 58,83,98,000 in 1925 but fell to Rs. 21,37,49,000 in 1933. The peculiar geographical situation of India gives her a favourable advantage in her sea-borne trade as she is in direct touch with all the principal countries of the world. The bulk of her imports come from Europe (65 per cent.) while Asia supplies 22 per cent., America 10 per cent., Africa 2 per cent. and Australia 1 per cent.

In the pre-war period we received 64 per cent. of our imports from the United Kingdom, 7 per cent. from Germany, 6 per cent. from Java, 3 per cent. from Japan and Germany, but in 1921 after the War was over our imports from the United Kingdom fell to 56, from Germany to 2.7 while the figures for Australia rose from 0.5 per cent. in 1913 to 3.5 for U. S. A. to 8.1, Japan 5.1 and Java 8.9 per cent. Taking the exports in 1913, six countries between themselves accounted for 64 per cent. of our exports (United Kingdom 24 per cent., Germany 10 per cent., Japan 9 per cent., U. S. A. 9 per cent., France 7 per cent. and Belgium 5 per cent.) but in 1921 the total exports to these countries fell to 57.8 per cent., the principal sufferers being the U. K. 4 per cent., Germany 3.3 per cent., France 3 per cent., Belgium 1.7 per cent., while Japan gained considerably, her increase being 4.7 and U. S. A. 1 per cent. Thus our exports are more evenly distributed than our imports. We derive 66.5 per cent. of our imports from the British Empire and send 41.2 per cent. of our exports to it. Taking some of the principal countries individually, we import more from the U. K. than we export to it. The same is the case with Australia and Java. We export more than we import from Germany, the U. S. A., Japan, Belgium, France and China. Our imports from the British Empire exceed our exports to it by more than double.

DIRECTION OF TRADE.

IMPORTS.

| Countries. | 1913-14. | 1927-28. | 1929-30. |
|------------------------|-----------|-----------|-----------|
| | Per cent. | Per cent. | Per cent. |
| United Kingdom .. | 64.1 | 47.7 | 42.8 |
| Germany .. | 6.9 | 6.1 | 6.6 |
| Java .. | 5.8 | 5.9 | 5.7 |
| Japan .. | 2.6 | 7.2 | 9.8 |
| U. S. A. .. | 2.6 | 8.2 | 7.3 |
| Belgium .. | 2.3 | 0.5 | 0.8 |
| Persia, Arabia etc. .. | 1.5 | 1.8 | 2.1 |
| France .. | 1.5 | 1.8 | 2.1 |
| Italy .. | 1.2 | 2.7 | 2.8 |
| Australia .. | 0.5 | 0.8 | 2.3 |
| China .. | 0.9 | 1.8 | 1.7 |
| Kenya .. | 0.3 | 1.0 | 1.4 |
| Ceylon .. | 0.4 | 0.8 | 0.7 |

EXPORTS.

| | | | |
|------------------------|------|------|------|
| United Kingdom .. | 23.4 | 25.0 | 21.9 |
| Germany .. | 10.6 | 9.9 | 8.3 |
| Japan .. | 9.1 | 8.9 | 10.2 |
| U. S. A. .. | 8.7 | 11.1 | 11.6 |
| France .. | 7.1 | 4.9 | 5.3 |
| Belgium .. | 4.8 | 3.3 | 3.8 |
| Ceylon .. | 3.6 | 4.8 | 4.2 |
| Persia, Arabia etc. .. | 3.2 | 2.5 | 2.1 |
| Italy .. | 3.1 | 3.9 | 3.6 |
| China .. | 2.3 | 1.4 | 4.1 |
| Australia .. | 1.6 | 2.0 | 1.8 |
| Kenya .. | 1.0 | 0.6 | 0.5 |
| Java .. | 0.8 | 0.7 | 1.3 |

From the analysis given above it is quite patent that the direction of India's foreign trade has undergone various

important changes during the past 20 years and a number of factors are operating which are likely to curtail our trade in various directions. For a long time India enjoyed a great advantage in having a virtual monopoly in certain classes of tropical or semi-tropical produce. This monopoly has been seriously threatened by the rapid opening up of extensive virgin areas in Africa, South America and the Islands of the Pacific and Indian Oceans having similar climate and soil conditions as India. The principal European countries, which formerly looked to India for the supply of raw material are developing their own tropical resources in Africa and Asia, while the advance of chemistry has succeeded in replacing many natural products of the soil by synthetic substances. Java with her cheaper and coarser tea has already proved a formidable rival in the London market and our exports to the United Kingdom have gone down from Rs. 29,78,52,000 in 1924 to Rs. 24,68,83,000 in 1926. Besides this, there is ample scope for the development of trade with the countries bordering the Indian Ocean, which with a proper study of the local requirements and facilities for marketing may in course of time expand.

Analysing the individual commodities we find that the principal sources of the import of cotton manufactures and yarn are the United Kingdom, Japan and the Netherlands while our export of these commodities are sent to the Straits Settlement, Persia, Ceylon and Hongkong. Japan is our most important customer of Raw Cotton, followed by China, Italy, Belgium, France and Germany. We import the largest quantity of raw silk from China but in our imports of silk manufactures Japan leads followed closely by China. The United Kingdom is our principal source of the supply of wool manufactures. It has already been stated that the Indian demand for metals, and metal goods including machinery and mill work is very large owing to the gradual industrialisation of the country. Belgium is our principal source of steel followed by the United Kingdom and Germany while the United Kingdom leads in iron followed by U. S. A. and Germany. We derive 80 per cent. of machinery, 90 per

cent. of railway plant, rolling stock and 40 per cent. of hardware from the United Kingdom, while the U. S. A. supply large quantities of mill machinery and Germany is an important source of hardware. Java alone accounts for 70 per cent. of our sugar imports followed at a long distance by Germany with her sugar beet. The U. S. A. supply the largest amount of mineral oil and Persia has displaced Borneo from the second place.

Our exports of Jute both raw and manufactured are widely distributed. We have nine customers of raw jute headed by Germany, the United Kingdom, U. S. A. and France while our gunny bags are purchased by more than 25 countries of the world, the most important of them being Australia, Cuba, Java, Japan; South Africa, U. S. A., Strait Settlement and Hongkong. Hessian or gunny cloth is principally exported to the U. S. A., Argentine, the United Kingdom and Canada. Our rice markets are mainly in countries bordering the Indian Ocean, *e.g.*, Ceylon, Strait Settlement, Sumatra, while the United Kingdom, Germany, Cuba, China and Japan are also important customers. In the export of Shellac, the U. S. A. is the principal market followed by the United Kingdom.

It has already been pointed out that England has a large share in our export trade. Various factors have contributed to this predominance, chief among them being the historical causes which gave England an initial commercial supremacy in India. Among the other factors, shipping is by far the most important. Almost the whole of India's trade is carried on English shipping which gives England a natural advantage over other countries. The most important banks in India as well as the most important industries are financed by England and are under British supervision, and these have helped to build up her trade with India. Germany made a determined attempt to capture the Indian market before the War and had established a strong foot-hold in certain lines, *e.g.*, raw hides and skins, raw cotton and jute but when the War broke out, it gave a tremendous opportunity to Japan and she has expanded her export trade in

cotton manufacture, matches, silk goods, etc., and her imports of rice and raw cotton have also increased. The U. S. A. are even now important markets for gunny cloth and raw skins and our important source of mineral oil. The principal features in the development of our trade with France have been the rapid expansion of our exports of oil-seeds particularly groundnuts and linseed and of raw cotton and jute.

TONNAGE LIST OF STEAMERS WHICH ENTERED
THE PORTS OF BRITISH INDIA.

| | | 1917. | 1926. |
|---------------|-------|-----------|-----------|
| British | | 3,400,118 | 5,745,000 |
| British India | | 101,733 | 113,980 |
| India | | 182,827 | 58,690 |
| American | | 36,054 | 268,420 |
| Chinese | | 49,084 | .. |
| Dutch | | 266,473 | 306,692 |
| Italian | | 265,231 | 430,590 |
| Japanese | | 590,790 | 632,900 |
| Grand Total | .. | 5,249,668 | 8,346,540 |

In addition to the foreign sea-borne trade, India has a fairly large coasting trade, between different sea-board provinces of India and Burma. In spite of the great coast line of India, the facilities for harbourage are limited; hence the expansion of the coastal trade has been impeded, the development of which is sure to relieve the congestion of railway traffic from port to port. The coastal trade has developed in commodities which are bulky as coal, teak wood, rice or in the imports and exports of Burma, *e.g.*, Kerosene oil and cotton (raw twist) and yarn and cotton piece-goods from Bombay and Calcutta, jute gunny bags entirely from Calcutta, tobacco leaf from Calcutta and Madras and in exchange she sends Kerosene oil and rice. The direction of this rice export varies from year to year according to the condition of the local harvest. Bengal takes 50 per cent. of

Burma's export of Kerosene oil, $22\frac{1}{2}$ per cent. goes to Bombay, 20 per cent. to Madras and $6\frac{1}{2}$ per cent. to Sind.

The total imports of merchandise in 1926 amounted to Rs. 83,68,01,000 out of which the share of Burma was 16 per cent. of imports and 32 per cent. of exports and of Bengal 19 per cent. and 17 per cent. respectively. All the provinces except Burma show an excess of imports over exports and in the case of Burma the exports exceed the imports by Rs. 11,13,51,000. The development of the coastal as well as of foreign trade is bound up intimately with the building up of the Indian mercantile marine. Not more than $12\frac{1}{2}$ per cent. of the coastal trade is carried in India owned vessels while about 95 per cent. of the foreign trade is borne in non-Indian streamers. Attempts are being made by the Government to train Indians in mercantile marine and it may be expected that within a short time India will have her own mercantile shipping lines.

CHAPTER XII.

OCEAN ROUTES AND PORTS.

Unlike roads and railroads the track followed by steamers and sailing ships does not require any permanent investment of capital, though the surveying and charting of the sea-bed is absolutely necessary for navigation. The ocean is free and any steamer is at liberty to pass through any portion of it, but as a matter of fact we find that the steamers tend to follow a well defined route and not any and every route at random. Routes are therefore determined by various factors and their direction is defined by various considerations. In the last century when the steam had not come to displace the sailing ship, the prevailing winds and direction of the ocean currents to a large extent determined the routes, *e.g.*, the tropical trade winds and the monsoon winds of the Indian Ocean. These considerations do not affect the modern steamers to an appreciable extent but they try to avoid an adverse current, particularly in the regions where ice from the Arctic or Antarctic circles can be borne. The time factor plays an important part in the selection of routes as steamers must proceed from port to port in the shortest time possible, but owing to the configuration of the land mass the routes have to converge in many localities through straits or channels, natural or artificial, *e.g.*, the Suez and Panama Canals. All routes from Europe and the South Asiatic ports to the Far East pass through the Strait of Macassar. Then again the possibility of the supply of the coal fuel has also determined the direction of the routes to some extent, as steamers can effect a large economy of space if they can have coaling stations on their way. Colombo and Singapore are very important coaling stations in the Indian Ocean and all steamer routes from Europe, from Africa, from Australia, from India and Burma and from the Far East converge at Colombo for re-fuelling. These coaling stations may or may

not have a local supply of coal, *e.g.*, Cape Town enjoys this advantage but no other port in the Indian Ocean has it. The routes usually pass close to countries, or touch at ports having a rich hinterland and a high standard of productivity either from the industrial or agricultural point of view. Just as in railways there is one trunk line which is served by a number of feeder and branch lines similarly in the Indian Ocean there is the great Asiatic route which meets the Mediterranean route at the Suez Canal and passes through the Strait of Babelmundab and proceeds diagonally to Colombo, then one branch proceeds straight to Australia, while another touches Singapore and runs northwards to China and Japan and then across the Pacific to the western coast of North America. This route is fed by branches at various points, one route from Africa meets at Aden and Colombo, one route from Bombay meets it at Aden, the Calcutta-Madras or direct Calcutta route touches it at Colombo which also receives the Rangoon steamers. The coastal route from Calcutta *via* Chittagong to Rangoon finally meets the Asiatic route at Singapore. The distance of Bombay from Southampton is 7030 miles and the time taken is 21 days, while Calcutta is 8980 miles away and it takes 28 days to reach Calcutta. The Zanzibar-Bombay direct route is 2900 miles long while the same route *via* Aden is longer by 900 miles. The distance from Aden to Colombo is 2420 miles and from Colombo to Calcutta by the direct route is 1430 miles. With the development of the port of Cochin on the Western Coast of India, Aden would be nearer to India by 300 miles and the distance of the route to Durban would also be reduced by 300 miles. Owing to the opening of the Panama Canal the Indian ports have been brought nearer to the ports on the eastern coast of North America but the Indian Ocean route has lost some of the trade which passed through it from New York to Yokohama *via* Suez Canal, as the Panama route has reduced the distance by 400 miles, but these steamers on their return journey usually follow the Indian Ocean route and pass through the Suez Canal. The total tonnage of merchandise passing from

south of the Suez Canal to its north invariably exceeds the tonnage in the opposite direction and the excess in 1925 was 808 million tons. "The trade of the Suez Canal (and therefore to a great extent of the Indian Ocean as a whole) consists fundamentally of the exchange of the food-stuffs and raw materials of the fertile soils of India and the Eastern Archipelago and of the mineral oil of Persia, for the manufactures of the West."* Foodstuffs are responsible for half of the exports, while mineral oil and textiles (raw and manufactured) together account for 25 per cent. On the other hand manufactured goods (including metal) account for 72 per cent. of the imports.

Ports are the gateways of commerce and the development of a port depends on a number of geographical and economic factors chief among which are the suitability of a place for the reception of ships and for the loading and unloading of their cargoes and the availability of terminal facilities. The large coast line of India is unbroken to such an extent that harbours where ships may find safe anchorage are very few. The west coast is extremely rocky and the depth of the sea right at the coast is very great, while the east coast though free from rocks is so very shallow and surf beaten as to make it unsafe for the anchorage of steamers and the plying of boats. The main possibilities of the development of ports on the west coast are the three natural inlets at Bombay, Goa and Cochin and the river mouths on the east coast. The South-West monsoon makes it impossible for steamers to have safe anchorage in those ports of the western coast which are not artificially protected, hence ports like Goa and Calicut are closed during the months of June to September. The second factor is the existence of an extensive hinterland, the produce of which will form the trade of the port. The ports of Orissa have not developed owing to the lack of any exportable surplus in the hinterland. The third factor is the existence of facilities of communication with the hinterland. This communication

* Cf. V. Anstey—The Trade of the Indian Ocean, p. 51.

may be by river or by railway or as in the case of Calcutta by both. The port of Chittagong could not develop till the railway facilities were improved and the Assam produce was diverted to it. The port of Vizagapatam on the east coast has been developed by constructing a direct railway connection with the Central Provinces, thus giving the port a wide hinterland and direct access. Ports which are not situated right on the sea coast but on tidal rivers or estuaries sprung up at what is called "the limit of ocean navigation" and they enjoy the double advantage of sailing in with the flow tide and sailing out with the ebb. Calcutta on the Hooghly is approached by large steamers owing to this advantage. These ports, like Rangoon and Calcutta also do not require any docks as the river quays can be used for the purpose. Some ports develop only as export points as Karachi and Rangoon while others like Calcutta and Bombay provide steamers with both inward and outward cargoes. Dhanuskodi in the southernmost point of India has developed more or less as a terminal port for the Ceylon trade. Madras is a typical example of an artificially created harbour, which is a challenge in the face of Nature, which in revenge gets in a home thrust at intervals."

Ports in many cases develop into manufacturing centres owing to the economy of utilising the imported raw material at the point of import, but Karachi has so far remained as an out and out exporting centre only. Karachi enjoys the advantage of being the nearest Indian port to England being 1450 miles from Aden and it is also the nearest Indian port to the Persian Gulf. It has an extensive hinterland extending over Sind, Rajputana, the Punjab, the North-western Province, Kashmir and Afghanistan. The extensive hinterland particularly with the development of wheat cultivation in the canal irrigated regions of the Punjab has made Karachi the largest wheat port of the British Empire. Karachi has no large flour industry as the other wheat ports, Calcutta and Bombay have but it exports a major portion of the wheat carried to the port by railways and there are ample facilities for the storage of wheat here. Owing to the very low

rainfall, which hardly exceeds 5 inches, wheat bags are stored in open sheds which is not possible either in Bombay or in Calcutta owing to heavy rainfall or greater humidity. Besides this, the port of Karachi, which was originally a landlocked lagoon, has been converted into a modern harbour which can safely accommodate "all ships that can pass through the Suez Canal." The continuous wharfage line of 8600 feet in length with 87 hydraulic cranes varying in capacity from 35 cwt. to 30 tons provides 17 berths while there are 20 moorings in the stream for ocean going steamers. The special wharf for country craft trade has now a length of 1824 feet.*

Karachi is served by the North-Western Railway which taps the Punjab and the N. W. F. Province and it has been joined by the Jodhpur-Bikanir Railway at Hyderabad thus furnishing an outlet for the produce of Rajputana. The main exports are wheat, cotton, oilseeds, wool, hides and skins, while Karachi imports cotton and woollen piece-goods, sugar, iron, steel and kerosene oil.

The number of vessels which entered the port rose from 3150 with a tonnage of 2,587,825 in 1930 to 3,314 with a tonnage of 2,411,610 in 1931-32. The volume of imports and exports, however, fell from 1,829,000 tons in 1930 to 1,626,000 tons in 1931-32.

Bombay is by far the most important port in the west coast, and its geographical position has mainly contributed to its rapid development. Its situation on an island gives it an extensive sea-front, and the facilities of a natural harbour. It is on the direct route to Europe and Africa. The extensive hinterland beyond Bombay is very fertile and yields wheat, cotton and oilseeds. The hinterland extends from the Hyderabad State in the south to Delhi in the north covering the Agra Division of the U. P., Eastern Rajputana, Central India, Central Provinces and all the Cotton districts of Bombay Provinces. Bombay is connected with the Gangetic plain, C. P., Bengal and Deccan by the G. I. P.

*Vide—Haji—Economics of Indian Shipping, p. 273.

Railway thus giving it a wide scope for the building up of its trade. Besides this owing to its prominent position on the western sea-board it carries on a considerable collecting and distributing trade with the coastal ports of the Presidency and Karachi.

The natural facilities which Bombay enjoys have given her a harbourage 10 miles in length with a width of 6 miles which has been provided with four wet docks and three dry docks of ample dimensions. The new Ballard Pier has proved to be a boon to the passenger traffic of which Bombay has a major portion. The extension of the railway lines right upto the docks has prevented the double handling of the goods and has contributed to the lowering of the cost.

The total trade of Bombay amounted to Rs. 204 crores in value in 1931-32. In that year 1866 vessels with a tonnage of 4,588,577 entered the port. The principal imports of Bombay consist of kerosene oil, cotton, piece-goods, sugar, timber, railway materials and coal while raw cotton, kerosene oil, oilseeds, wheat, hides and skin, manganese ore figure prominently in her export trade. The value of raw cotton exported from Bombay is about one-third of the value of all raw materials exported from India. These exports depend not only on the geographical factors connected with the monsoon and the cotton harvest in India but also on the manufacturer's demand based on the supplies from Egypt and America. Lancashire was the principal destination of raw cotton before the War, but in recent years, Japan has displaced it. Bombay is not only a cotton port but her trade in oilseeds is also considerable, which she shares with Calcutta. Bombay leads in the export of sesamum, cotton and castor seed. Germany has in recent years regained her position as the leading importer of Indian oilseeds. In spite of her natural advantage in situation, Bombay has a serious deficiency in the absence of any coalfields in the neighbourhood, hence she has to depend on coal imported from Wales and South Africa but during the last decade with the inauguration of the hydro-electric installation at Lonavla she is now in a position to utilise

cheap electric energy for her mills. Bombay is an industrial city of great importance, her principal industry being the spinning of cotton yarn and the weaving of cotton cloth. Her 112 mills produce about 74 per cent. of the quantity of yarn spun in India. This industry is further facilitated by the high humidity of the atmosphere which is very favourable to spinning and weaving.

Unlike Bombay, Karachi and Madras, Calcutta is a river port, the sea being 80 miles away, hence the most important problem in connection with navigation here is to keep the river approaches free by dredging the bars and by lighting up the river from Saugor to Mud Point, so as to make night navigation possible. Calcutta in spite of these natural handicaps, is very favourably situated for trade, as she commands a very extensive hinterland from Eastern Punjab to Assam, *i.e.* the entire Ganges and Brahmaputra valleys and the uplands of Chota Nagpur and Central Provinces. This hinterland is rich not only in agricultural and forest produce but also in minerals, particularly coal, iron and mica. All these have made this region highly industrialised and the principal gateway of these industrial and commercial products is Calcutta, which is served by three important railway systems and a net work of rivers including the Ganges and the Brahmaputra. The E. I. Railway runs throughout the entire length of the Gangetic valley connecting Calcutta with Bihar, the U. P. and the Punjab while the B. N. Railway connects Calcutta with the coal, iron and manganese tracts of Bihar, Chota Nagpur and Central Provinces and the E. B. Railway taps the jute and rice areas of Bengal and the tobacco and tea districts of the sub-Himalayan region. The net work of rivers in Eastern Bengal facilitates the transport of jute and rice to Calcutta. Thus all the important railway and river routes converge on the port of Calcutta and make it the greatest centre for imports and exports in India.

The limits of the Calcutta port extend from Cossipore right up to Budge Budge, 16 miles away, where the petro-

leum wharf with a total storage capacity of 50 million gallons is situated. This entire area is being rapidly fitted with docks and jetties with direct railway communication and all modern facilities for loading and unloading. The entire river frontage from Cossipore to Garden Reach is lined with warehouses for the storage of tea, hides and jute. With the completion of the King George's Docks at Garden Reach new dock entrances have been provided and the capacity of the port has been considerably expanded. This has been justified by doubling of the tonnage entering the port in 10 years from 2,804,680 tons in 1916 to 4,381,953 in 1930. Both the B. N. Railway and the E. I. Railway run along the right bank of the Hooghly. The goods waggons are transported across the river by the B. N. Railway waggon ferry at Shalimar, while the E. I. Railway goods trucks are diverted over the E. B. Railway *via* Bandel and Naihati, but neither of these arrangements is at all satisfactory, hence it is proposed to concentrate all goods traffic over the new bridge on the Hooghly at Bally. The opening of the Burdwan Chord section on the E. I. Railway has given a direct and shorter route to the port for the coal traffic from Jharia and Raniganj. The Cossipore side of the river as well as the right bank from Howrah to Sibpore have wharves for dealing with the inland river-borne traffic, so that enough space has been found at the Kidderpore Docks for handling the foreign trade.

The principal imports of Calcutta are Salt, Petroleum, Sugar, Iron and Steel, Burma rice and timber while the main exports consist of coal (including bunker coal) raw and manufactured Jute, Oilseeds, Tea and Manganese Ore.

The imports of salt come mainly from Liverpool and it is transported over the E. I. Railway to stations up to Moghalsarai and to the B. N. Railway *via* Mokamah Ghat. The imports of sugar are derived from Java, Germany, Czechoslovakia, Canada, Poland and the United Kingdom but Java alone contributed Rs. 6,74,03,540 out of total imports of sugar valued at Rs. 7,19,80,530. Calcutta imports

51 per cent. of the total amount of sugar received from Java. Coal exported from Calcutta goes to Ceylon, Strait Settlements and Java, in addition to Madras, Bombay and Sind. In 1920 Calcutta exported 2,544,408 tons of coal about 45 per cent. of which was intended for foreign ports and the rest was for Indian ports in which the share of Burma was 31 per cent., Bombay 30 per cent. and Madras 13 per cent. It

is said that as Bombay is built on cotton, Calcutta is built on jute. Jute is grown in the Presidency of Bengal and exported through Calcutta either in the raw condition or after being manufactured into gunny cloth and gunny bags. Raw jute is despatched to Calcutta by the river for bailing before its being exported. In 1931-32 the exports of raw jute amounted to 587,000 tons, of gunny bags to 389,000,000; and to 1,021 million yards of gunny cloth.

Calcutta and Chittagong are the leading ports for the export of tea. These two between themselves account for 90 per cent. of the total Indian exports, out of which the share of Calcutta is about 80 per cent. Calcutta held a practical monopoly in the export trade of tea till Chittagong appeared as a rival in 1910 and the volume of exports from this port is gradually on the increase. Calcutta is the point for the collection and export of raw hides from the U. P. and the Northern districts of Bengal and she has 51 per cent. of the export trade in raw hides while she leads also in the export of Goat-skins.

Bombay was for a long time the principal centre for the export of Manganese Ore, but since 1923, Calcutta has taken the lead with 381,290 tons as against 347,723 tons exported by Bombay. This noticeable increase is due to the development of Manganese mining in Chota Nagpur and Orissa and the diversion of the export of a part of the manganese ment of manganese mining in Chota Nagpur and Orissa and improved railway facilities and favourable railway rates.

Calcutta is also the greatest industrial centre of India, the chief industry being the manufacture of jute while in

the neighbourhood there are flourishing cotton mills, paper mills, flour mills, etc. The main reason for the development of these industries is that they derive the dual advantage of the excellent transport facilities and the facilities of the port for imports and exports. Madras is the most important port on the Coromondal coast. The harbour has been artificially protected by two concrete walls which give shelter to 15 steamers at a time. The wharves and quays are all fitted with modern hydraulic cranes and other appliances so as to enable the steamers to load and unload with ease. The harbour is thus one of the best equipped ports of India and it commands a hinterland which is less productive than the hinterland of Calcutta. It covers the Madras Presidency and the two important states of Hyderabad and Mysore. Madras is connected with Northern India, C. P. and Bombay Presidency by the M. S. M. Railway and with the southern portion of the Peninsula by the S. I. Railway. The principal imports of Madras are manufactured cotton, metals, railway plant and rolling stock, sugar, spices, while the chief exports are oilseeds, tanned skin and hides, raw cotton, grain and pulse, coffee, tea, manufactured cotton and spices. Madras is essentially the Groundnut port of India as its export amounts to about 70 per cent. of the total exports of groundnut from India. France is our principal customer and about 80 per cent. of the Madras exports go to Marseilles. The exports of groundnuts are likely to increase with the large expansion which has taken place in the cultivation of groundnut in the Madras Presidency which claims an acreage of 2,680,156 in 1926 as against 1,412,000 in 1917.

Rangoon, a tidal port, is the third largest port in Indian Empire. It is situated on the Rangoon or Hlaing river 24 miles from the sea. Its location enables it to tap the resources of the entire Irrawady and Sittang valleys. The products of Upper Burma are despatched by the Irrawady down which is floated timber from the Pegu Yoma. Boats come to Rangoon laden with paddy from the Sittang valley, the Deltaic region and from the Yenangyaung and Singu Oil Belts, while the Burma Railway connects the port with Upper

Burma and other portions of the province such as Bassein, Henzada and the Northern Frontier. A large coasting trade is in existence with Rangoon as the centre and Tin is despatched from Tavoy, paddy from Moulmein and the Arrakan coast. Thus the hinterland of Rangoon covers the entire province of Burma and 90 per cent. of the foreign trade of Burma passes through this port.

The equipment of the port of Rangoon is not as effective as in Calcutta or Bombay and the shifting of the river bed and the sands of the Hastings Shoal sometimes prove rather dangerous for the shipping and these troubles are likely to be removed with the completion of the new dock extensions.

The principal exports of Rangoon are Rice, Petroleum, Timber and Oilseeds. Just as Calcutta is pre-eminently a jute port Rangoon is the Rice port of India. Burma rice is not only important as a commodity for export but also for making up a deficiency in the Indian harvest. Rangoon rice has in recent years had to face keen competition in the European markets from rice of Siam and Indo-China and Java. The rice is milled before export in the Rice Mills in and around Rangoon. The principal markets of Rangoon rice are the United Kingdom, Germany, Strait Settlement, Ceylon, Belgium, Cuba, China and Italy.

Burma teak is exported in enormous quantities both on Government account as well on private account. The exports amounted to 33,313 cubic tons in 1918. Among the refinery products of petroleum, paraffin wax is one of the most important and Rangoon exports 95 per cent. of the wax produced in India. The exports amounted in 1926 to 38,395 tons valued at Rs. 484,59,000 and the principal customers are the United Kingdom, South Africa, Portuguese East Africa and Japan. Rangoon leads in the export of unmanufactured tobacco with a percentage of 48. This tobacco is in strong demand in France and the U. K. for the manufacture of Cigarettes. Burma also has the leading share in the export of Cigars made from local tobacco and imported Madras tobacco. Rangoon's share in the export of these Cigar is about 30 per cent.

The imports of Rangoon include cotton yarn and piece-goods, metals, silk, sugar, salt; machinery and hardware. The salt trade was developed by Germany. The German steamers that went to Rangoon to load rice were utilised in pushing the trade in German salt which was carried directly from Bremen at lower rates of freight than were charged by British steamers from Liverpool.”*

Besides these five leading ports of India, among the second class ports the most important are Chittagong, Tuticorin and Cochin. Chittagong like Calcutta is a river port being situated on the Karnafuli, 11 miles from the sea. It is the nearest port for Assam and the eastern portion of Bengal as well as for the frontier districts of Burma, but the export trade has been considerably hampered by the fact that the sea freights from Calcutta and the trade conditions of Calcutta favour the latter as a port for the traffic which originates in the hinterland of Chittagong, but this port gets a heavy traffic in tea chests despatched direct from the gardens for shipment to the United Kingdom and U. S. A. In jute trade, Calcutta has a great advantage over Chittagong in that it purchases just for local manufacture as well as for export, and mixes the fibre of various places. Chittagong has not developed any jute manufacturing industry, hence what she gets is intended mainly for export to Dundee. Chittagong exemplifies the influence of railways on port development as the traffic of this port has expanded as the result of the linking up of Assam with Chittagong by the direct route. The rates of the A. B. Railway have been framed in such a way as to secure to Chittagong the entire Tea traffic of Assam intended for direct shipment to England or U. S. A. while Calcutta receives tea intended for local consumption or for export to Russia and the Persian Gulf. Chittagong attracts, in good years, a heavy quantity of rice from the Tipperah, Mymensingh and Dacca districts of Bengal and the Sylhet valley of Assam for export while in bad years it acts as the distributory for imported Burma rice.

Tuticorin is situated to the east of Cape Comorin and it is the second largest port of Southern India. Its hinter-

land is rich in cotton and it is connected with the rest of India by the South Indian Railway which runs alongside the shipping wharves. It has no harbour and steamers have to lie off at a distance of five miles from the shore. Schemes are in hand to provide an entrance to a deep water basin to be constructed on the landward side of Hare Island and to convert Tuticorin into a deep-water harbour capable of accommodating even the largest steamers. With the provision of these facilities of loading alongside of deep-water wharves, it is expected that the opening of the Dhanuskodi route for the Ceylon traffic, will not materially affect its trade. Tuticorin at present has a large trade with Ceylon in rice, pulses and chillies and with Japan and the United Kingdom in raw cotton.

Cochin is the most important port in the western coast of Southern India and the system of back waters which run parallel to the coast makes transport cheap but owing to the sandbar at the entrance, steamers have to anchor at a distance of $2\frac{1}{2}$ miles. When this bar is removed, the harbour would be able to offer safe anchorage even during the S. W. monsoon to fifteen large steamers. Development of this port is also dependent on the improvement of railway connections. The hinterland is rich in rubber, tea and limber as the forest resources of the state and the region beyond it are extensive and railway communication is necessary between Trichur and Palghat, Sholanur and Manantoddy to tap this forest wealth.

Unlike other ports of the Konkan coast, Mormugao is open in all seasons of the year as the result of the construction of a quay wall which affords safe anchorage for ocean going steamers. The port is situated at a point of vantage as it is the sole outlet of the Mysore and Hyderabad States and also of the fertile district of Dharwar and Belgaum. The M. S. M. Railway which also manages the West Indian Portuguese Railway connects the port with the hinterland and the Portuguese Government is pursuing an active policy for fostering the development of the port. The distance from Aden to Mormugao is about equal to the distance from

Aden to Bombay. The chief exports of the port consist of Cotton, Oilseeds, Salt, Cocoanut and Arecanuts.

Vizagapatam is situated 545 miles south of Calcutta and it offers a splendid scope for development into a first class harbour. The Central Province, with its extensive forest and mineral resources and fertile cotton tracts has no sea-board of its own, and commodities have to be shipped off at Calcutta or Bombay and she is connected with Madras by a circuitous route. The B. N. Railway is opening up the eastern portion of the C. P. by connecting Raipur with Vizianagram close to Vizagapatam which is the meeting point between the east coast section of the B. N. Railway running from Calcutta and the M. S. M. Railway proceeding from Madras after its junction with the Nizam's State Railway at Bezwada. Thus Vizagapatam will secure a vast hinterland served by an extensive network of railways which will bring many parts into closer connection with the sea traffic.

The physical conditions of Vizagapatam are very favourable for the formation of an extensive harbour. There is a shallow bay about 4 miles in width bounded on the south by the headland known as the Dolphin's Nose, to the north of which the river Maonderu flows into the sea through a channel of about 500 ft. in width. This area has been formed into a land-locked harbour with sufficient depth of water for the anchorage of large vessels. This harbour will further shorten the distance from Bombay to Rangoon and it will serve as a link in the most direct route from Rangoon to Europe.

CHAPTER XIII.

DISTRIBUTION OF POPULATION.

Man is by nature a social animal and as such he prefers to live in the community of fellowmen. These human communities are scattered all over the face of the globe in varying proportions, in some regions the density is great, in others the population is scanty. Man is engaged in constant struggle with his environment and he is endeavouring to prove superior to the forces of nature by bringing them under his control. That is why we find a constant shifting of the population from one locality to another according as the natural conditions are favourable or not. This movement of population occurs mainly from the more favoured to less favoured regions and the new adjustment only tends to make the struggle for existence keener. The course of Aryan immigration into India gives support to this view as the Aryans first settled in the well irrigated and fertile river banks of the Punjab but were pushed eastward only when the density became so great as to exhaust the local food supply.

India has a wide variation in the density of her population as one-half of her population occupies only about 1/6th of the area while one-third of the population covers rather more than two-third of the area. Northern Kashmir, portions of Assam, Baluchistan and Western Rajputana have a density below 40, and Sind, portion of the Punjab, the eastern portion of the Central Provinces, Chota Nagpur, Central Burma have a density below 100 while the entire Gangetic and Brahmaputra Valleys, Travancore and Cochin have a density higher than 450 per square mile. Taking the the provinces individually we notice this variation, Bengal has 608, United Provinces comes next with 427 and Bihar is third with 409 and all these provinces are served by the two mighty river systems of the Ganges and Brahmaputra. On

the other side of the scale are Rajputana with 76, Burma with 57, Kashmir with 39 and Baluchistan with only 8 persons per square mile.

This wide diversity is caused by a number of factors. Certain essential conditions are necessary to enable mankind to multiply, *e.g.*, food, clothing, healthy climate; security of life and property. The availability of food supplies either by local production or by imports from other regions is the most important factor. In agricultural regions, the fertility of the soil contributes to the local food supply and in other areas, the existence of industries, either manufacturing or extractive, is necessary to engage the population and give them the means to command the food grown in other agricultural areas. Water supplies are necessary for man and beast as for plant life and this water supply may be derived from rainfall, rivers or artificial irrigation. Tropical countries with high summer and winter temperatures obviate the necessity of much clothing and shelter to protect the life of man, hence population tends to multiply quicker in the Tropics than in the Himalayan or Arctic regions. Healthy climate not only brings about a high density of population but it enables them to resist occasional attacks of epidemics and to engage themselves in the acquisition of wealth. The lack of security of life and property in the past has stood in the way of the accumulation of capital, the development of industries and the growth of population, as people have dreaded to reside in the regions usually overrun by the invaders. All these factors however react on one another, *e.g.*, security gives rise to various agricultural industries which in their turn push up the standard of living.

The increase or decrease of the population of a country depends, as we have seen, on various factors, and the increase is beneficial to the country only when it helps to bring about a proper adjustment of the population to the economic resources with a view to secure not merely maximum economic welfare for each individual which is really

maximum income per head. There is for every country at a particular time an optimum number which is mainly determined by the economic environment, and when this environment improves, and greater resources are available the optimum number is bound to change also. Hence over population really becomes a passing phase and the excess of one period of time or of one country can very well be reduced with an expansion of the economic resources of the country. Thus the extremely high density of population in North Bihar, or in the easternmost districts of Bengal necessarily indicates that the local conditions are quite capable of maintaining this high pressure and that if the optimum limit is overtaken, either there will be a further expansion of local resources bringing about greater economic efficiency or that the surplus population will migrate to other regions.

In an agricultural country like India the physical configuration of the land is the most important factor in the distribution of population. Continuous cultivation is only possible with a level surface possessing fertility and having good drainage for the removal of the surplus water, hence mountainous regions are not at all suitable for agriculture though terrace cultivation has been resorted to in the lower Himalayan slopes. The level Indo-Gangetic plain has a high standard of intensive cultivation and this accounts for the high density of population in this region which varies from 608 in Benagl to 409 in Bihar and Orissa. The mountainous regions of Upper Burma have a density varying from 13 to 16, the Agency Tracts of Madras have 75 and the same is the case with the Himalayan districts of Simla and Kangra Valley in the Punjab.

The next important factor which affects density of population is rainfall. Steady rainfall between 40 to 50 inches per year is extremely favourable for agriculture and high density while the lack of rainfall or its paucity does not foster the development of population unless the deficiency is made good by artificial irrigation. Eastern Bengal has a very high density exceeding 625 per square mile with

a rainfall exceeding 100 inches per year, while in Sind the density does not exceed 70 with a rainfall of about 8 inches and this density is to be found only near the banks of the Indus or in the irrigated area. The density varies however in an inverse ratio with rainfall after the limit is reached, *e.g.*, Assam has about thrice heavier rainfall than Gujerat, but in the latter area the density (292) is more than double that of Assam (130). In the Punjab, the density is greater in a block of 10 districts round about Amritsar as the rainfall is fairly good, the sub-soil water level is high and the country is level. The rainfall should be spread uniformly throughout the year so as to facilitate the production of a number of crops. Areas having irregular rainfall, like Gujerat, cannot have a great density even though the country is level and the soil is fertile while areas of regular rainfall like the coastal regions in Madras have a high density, *e.g.*, Godavari district has 578, Malabar 585 and Cochin 662. Next to rainfall, irrigation is important in increasing the density. The Doab tracts of the Punjab are becoming thickly populated owing to the expansion of the Canal irrigation there. In the Punjab, density depends entirely on irrigation in areas which have a rainfall below 20 inches. This is also illustrated in Baluchistan, as in the Chagai district where the rainfall is scanty and irrigation facilities do not exist the density is 1 per square mile while Quetta has a density of 26 due mainly to the snowfall in the surrounding hills feeding the well system and making up the deficiency in the rainfall. The irrigated portion of Sindh has a medium density (225), *e.g.*, Hyderabad has 130 while it is as low as 29 in districts of Thar and Parkar. In the irrigated areas of the United Provinces the density is much higher than in the other portions. The western districts of Bengal have a good rainfall and fertile soil, but owing to disturbances in the drainage system of the country and the silting up of many rivers and streams water logging has taken place bringing about a lowering of the yield and an insanitary environment, both of which have seriously affected the density of population. During the first decade of this century

the six western districts of Bengal have lost heavily in population, the most important decrease being in Birbhum and Bankura amounting to 9.4 and 10.4 per cent. respectively. Central Bengal shows a static condition where the population has remained stationary. Water logging is principally responsible for the widespread prevalence of malaria and the very high percentage of mortality in these areas. The decrease in the population possibly would have been larger but for the innate conservativeness of the people which makes them cling to their villages and prevents them from emigrating to healthier regions, but this chronic unhealthy condition is responsible for the gradual physical deterioration of the people and their lack of capacity for hard manual labour which is evidenced by the seasonal immigration of thousands of labourers for agricultural work from other provinces of India. In Western Bengal we notice an actual contraction in the cultivated area as the percentage of the twice cropped area is lower than in East Bengal. The malarious environment and the decline in the fertility account for the large proportion of cultivable fallow land in West Bengal, *e.g.*, it is as high as 22 per cent. in Bankura district. Among crops rice helps most in increasing the density of population. In East Bengal the area under the wet rice and the double cropped area has increased and it co-exists with high rural density. In this region we come across some of the highest rural density figures in the world, *e.g.*, the Thanas of Sonaikunda, Lohaganj, Tangibari and Munshiganj in the district of Dacca have a density of 2873, 2733, 2680 and 2347 respectively while Lonesing in Faridpur has 2076; Banaripara in Bakarganj has 1549, Bancharampur in the district of Tipperah has 1437 per square mile. In the Hyderabad State the density is higher (155) in rice producing Telingana than in the Cotton districts of Maratwara (146). Orchards and coconut plantations contribute to high density as in the sea coast regions of Bengal, Travancore and Cochin.

Population is to a large extent limited by the food supply in a particular region, hence the local food crops are very

important in maintaining a high density of population but with the development of the means of transport, and the greater facility with which food can be collected from the centres of production, the cultivation of money crops like jute, cotton, sugarcane, tobacco and chillies has contributed to an increase in the density. The heavy density of the areas bordering the Meghna from Nabinagar to Chandpur in Bengal (1440) is mainly due to the cultivation of both jute and chillies in addition to rice. The cotton growing district of Kaira in Bombay has a density of 445, and the famous Saraisa Perghana in the Darbhanga district of Bihar which grows tobacco and chillies has a density higher than 600 per square mile.

In the deltaic areas of Bengal and Madras, greater density occurs in the regions where the alluvium is of recent origin as compared to former formations and the fertility of land recently formed is very high.

In mountainous areas particularly in Baluchistan nomadism still prevails. The people in general have not yet left the pastoral stage and have not settled down to an agricultural life. Those of them who have done so leave their villages during certain periods and go back to their tents and move about from hill to hill. The principal causes of this are extremes of climate, the pastoral habits of the people and lack of cultivable and irrigable land. The same state of things prevails even now in the Lushai and Garo Hills in the north-east where the aboriginal tribes practise what is known as "Joom" cultivation. The tendency in both these cases seems to be in the direction of greater settled life in villages with an expansion of the irrigational facilities in those regions.

Agriculture brings about an uniform distribution of the population, but industries favour a concentration in suitable centres which may be independent of the local food supply. Mining is carried on mostly in places which are either unfit for cultivation or have poor local crops. The Raniganj and Jherriah coalfields do not afford much scope for agricultural

activities and the food supply has to be imported from other areas. The Kolar gold area gets its water supply and electric power from a great distance and it has no local production of food crops. Iron mining at Garumahisani is carried on in a locality which does not grow any crops and but for the railway communication which has been opened for this purpose, this region would be almost inaccessible. The increase in the density of the population of Chota Nagpur is going on at a rapid rate as the prospect of the industrial development of the coal, iron, mica and other minerals are unbounded. Jamshedpur, Jherriah, Asansole and Raniganj are fast increasing in density. The cotton weaving industry is responsible for the congregation of a large population in Bombay, Ahmedabad and Sholapur. In course of one decade the increase in Bombay City has been by 20 per cent. and its suburbs have increased by 42 per cent., Ahmedabad 17 per cent., while Sholapur has doubled its population. The jute industry in and round about Calcutta is responsible for a similar state of things. The population in the tea gardens of Assam has increased by 37 per cent. between 1911-1921. Labourers in these areas are mostly immigrants who in addition to their own work carry on cultivation and grow garden crops. In addition to these labourers, hillmen and ordinary cultivators also work sometimes in these gardens, *e.g.*, some do the ploughing, while others perform hoeing and the cutting of jungles. The last great war pushed up the price of tea owing to the stoppage of the supplies of the Russian tea but a depression soon ensued owing to over production and many gardens had to be abandoned. This has reduced the labour force and has consequently affected the density of population to a material extent.

The coal mining area to some extent grows its own food as the miner is primarily a cultivator and mining is his subsidiary occupation, hence during the sowing and harvesting seasons there is a distinct scarcity of mining labour. A good harvest or the outbreak of any epidemic has a great effect on the supply of labour. Resident miners are yet very few but the signs are not wanting which point to a gradual

development of a bonafide mining population in the Jherriah area. The present depression in the coal industry has lowered the mining population as many small mines are not working.

The limit of the expansion of population in the industries is determined mainly by the quantity of the deposit which is being worked or by the supply of the raw material which is being used in the industry or by the possibility of the discovery of new sources of the supply of the raw material. Chota Nagpur is gradually developing her diverse mineral resources and the density of population in this region is steadily increasing.

Various other factors influence the distribution of the population, most important of which is the historical cause. In Central Province owing to the mountain barrier in the north the course of Aryan migration was arrested, then later in history the entire Maratha plain and Berar were ravaged at frequent intervals by the Pindaries and portions of this tract formed the stage of warfare of the Mughal, Pathan and Maratha powers. All these contributed to a paucity of population which however is fast increasing in density with the establishment of peace and order under British rule and the establishment of railway communication. The Maratha plain has a density of 154 while the figures for Berar and Chattisgarh plain are 122 and 114 respectively. In Bengal, the distribution of population was formerly governed by political factors, as, the tenants could only get security and peace if they lived in the immediate neighbourhood and under the protection of their powerful chiefs, hence, density was greater in areas close to the capital of the more important ruling families of medieval Bengal, *e.g.*, Nadia, Burdwan, Bishnupore, Rajbari, Murshidabad, etc. In recent times, however, climatic and agricultural conditions are exercising a greater influence on the distribution in Bengal. In the North-West Frontier Province the importance of security as a factor in the increase of density is evidenced by the rapid growth of population in the British districts, *e.g.*, Peshawar has a density of 348.

The pressure of the population on the soil brings out another aspect of the problem of the distribution of population. We have already seen that some areas have a very high density while other areas, even though equally endowed with agricultural or other natural resources, have a striking paucity of population hence we notice a movement of population as the result of which the surplus population of one locality is attracted to another. Agricultural conditions to a large extent determine the density of population in any locality, hence when this limit has been reached the surplus must find employment elsewhere. The districts of Gorakhpur and Basti in U. P. have a density exceeding 700 and the district of Saran in Bihar has a density as high as 872 and a constant stream of emigration flows out from these districts, while the equally high density noticeable in Gurgaon, Ambala and Gujerat has been relieved by the expansion of the sugarcane cultivation as a result of canal irrigation.

Inter-provincial migration begins as a casual movement of the population as the result of a failure of the harvest or the outbreak of an epidemic like the Influenza of 1918, then it assumes a seasonal character, mobility being greater during the period when there is no work left in the field. Migration takes place as the result of an increase of demand for the production of a special crop as tea and coffee, for making up an deficiency in the local labour for particular agricultural operations, as sowing and harvesting in North Bengal, or for working the mine or for manning the industries. A more permanent migration follows a temporary one, when the emigrant takes his whole family with him and settles down in a district where the agricultural possibilities are more hopeful than in his native place. Migration is very intimately connected with the problem of acclimatisation, *e.g.*, labourers from the U. P. and Bihar take a long time to be acclimatised to the damp climate of Southern Bengal while emigrants from Orissa to Bengal do not feel the change at all.

Assam is the most important province of India from the point of view of emigration as about 16 per cent. of her

population consists of emigrants numbering 1½ million persons. Tea is her most important industry and it has attracted labour for the last 50 years from other provinces. The system of recruitment of tea labour has been considerably improved as the result of the interference of the Government. The Tea garden labour is drawn from Bihar and Orissa, C. P., Madras, U. P.; Bengal and Central India and the number of immigrants depends on the condition of the crop at home and the prospects of the tea industry. A fair percentage of these labourers settle down round about the garden where they are employed and take to agriculture or small scale industries.

Another stream of immigration flows into the Brahmaputra valley of Assam from the eastern districts of Bengal. These immigrants are more or less of the type of colonists and the proportion of women among them is high. These people come from the districts of Mymensingh, Pabna, Bogra and Rungpur and they represent either the surplus population of these areas or those who have lost their homes and lands due to diluvion of the Bengal rivers. The Brahmaputra valley, particularly the districts of Goalpara and Kamrup, offers them plenty of fertile lands with low rent and the facilities of the Ryotwari tenure, and a climate not much dissimilar to their native districts. About 85 per cent. of these colonies are Mahomedans.

Bengal has three distinct types of immigration. Industrial immigration is mainly centralised in the area round about the Calcutta jute mills and the tea districts of Jalpaiguri and Darjeeling. The jute mills are served by people from Bihar and Orissa and the U. P. while the tea gardens recruit their labour from Nepal and Chota Nagpur. Labour from Orissa is mainly unskilled while the Bihari labourer is skilled, and besides those who work in the organised industries there are many who are employed as menials, or set up business as milkmen, cartmen, hawkers or petty shopkeepers. The tea garden labour is principally derived from Chota Nagpur as the people of this division make efficient

outdoor labourers. They have not been able to adapt themselves to work in factories and mills. The second type of immigration is mainly for agricultural work and more than 2 lakhs of labourers come to the neighbouring districts of Birbhum, Maldah and Dinajpur from the Sonthal Perghanas. The third type is the internal redistribution of population which is gradually becoming prominent. Owing to the silting up of many streams in Central Bengal, the productivity of the soil has suffered and this has reduced the capacity of the area to support the existing population, hence one stream of population moves to the industrial districts of South Bengal and to the coalfields and the other stream flows to the tobacco and jute districts of North Bengal and to the fertile native state of Tripura which is rapidly increasing in population. Besides this, there is a large immigration from Chittagong to Burma for the rice and petroleum industries.

In the C. P. the western districts growing wheat and cotton attract labour from the U. P. and Central India, and the eastern districts particularly the rice tracts of Chattisgarh and Wainganga valley send out thousands of emigrants to the coalfields of Bihar and to the tea gardens of Assam. The cotton districts of Berar attracts a large number of labourers from Hyderabad and the Bombay Presidency. The Nimar district offers some scope for colonisation by the people from Central India.

Burma has a large volume of immigration from India, particularly from Madras, Bengal and the U. P. mainly composed of Hindus. The sources of labour in Madras are Ganjam, Vizagapatam and Godavari while in the U. P. Fyzabad and Sultanpur account for the majority of the immigrants. The gradual increase in the percentage of women among the immigrants indicates that the casual nature of immigration is about to assume the colonisation type.

While in Bihar and Orissa there is a large volume of emigrants eastwards to Bengal and Assam, her own indus-

tries and mines are being worked to a large extent by immigrant labour from Madras, the eastern districts of C. P., U. P. and Bombay. The existence of waste lands in the Orissa States, in the Sonthal Perghanas, Purnea and Sambalpur districts has resulted in an immigration of settlers from the U. P. and other parts of the Province for agricultural work.

The growth of the factory system in India and the development of large scale industries have resulted in an unprecedented concentration of population in industrial areas particularly in towns close to coal or iron mines or having easy access to them. The mining areas in particular are situated in sparsely populated regions, hence labour have to be imported into these areas from other localities. The coalfields of Bengal and Bihar, the iron industry at Jamshedpur, the cotton mills of Bombay, Ahmedabad and Sholapur and the jute industry of Calcutta have to depend on labour drawn from other provinces :—

GAIN AND LOSS BY MIGRATION.

1921.

| Province. | Immigration. | Emigration. | Net gain or loss. |
|-----------|--------------|-------------|-------------------|
| Assam | 1,216,661 | 75,910 | +1,140,752 |
| Bengal | 1,817,775 | 685,580 | +1,286,430 |
| Burma | 572,530 | 19,060 | +553,470 |
| C. P. | 603,924 | 406,601 | +197,323 |
| Punjab | 674,395 | 500,294 | +174,101 |
| Bombay | 1,039,622 | 567,599 | +472,023 |
| B. & O. | 387,068 | 1,955,036 | —1,567,968 |
| U. P. | 425,152 | 1,399,794 | —974,642 |
| Madras | 196,609 | 914,792 | —718,183 |

India's past history proves that India at one time pursued an active policy of colonisation. Sumatra, Java, Bali and Siam even to-day contain relics testifying to the colonising activities of the Indians. In modern times how-

ever Indian emigration to other countries has taken the form of supplying labour for working the industries there. With the abolition of slavery in the British colonies in 1834 there cropped up a great demand for labour in the sugar-cane plantations in Mauritius and labourers from India were sent in large numbers to these places and to Jamaica, British Guiana and Trinidad.

Later on emigrants went to Natal, Fiji and Kenya and began to settle in these countries with a view to carry on agriculture and trade on their own account. The growth of Indian colonies in various parts of these countries brought the Indians into keen rivalry with the European settlers owing to their ability to undercut the prices due to their low standard of living. This has put a check to the flow of emigration in recent years.

About 80 per cent. of the emigrants are Hindus and 10 per cent. are Muhamedans. The bulk of emigration (80 per cent.), is from Madras, while the balance is made up from Bombay, the Punjab, U. P. and Bengal. The direction of emigration is principally towards Ceylon and Strait Settlements, while Natal accounts for 47000, Trinidad 37000, Fiji 33000 and Mauritius and Kenya 1700 each. The emigrants to Ceylon mainly come from the Trichinopoly, Madura, Ramnad and Tanjore districts and also the Telegu districts of Godavari, Guntur and Cuddapah. In Northern India, the emigrants mainly hail from the congested districts of Basti, Fyzabad, Rae Bareilly, Gorakhpur and Allahabad in U. P. and Sahabad, Patna and Darbhanga districts of Bihar.

Besides these a small number of Sikh emigrants are to be found in the New South Wales and Queensland Provinces of Australia, or in British Columbia where they are engaged in retail trade or in agriculture. The Indian population of the Federated Malaya States exceeds 305,000 and they are employed in large numbers in the sugar estates in Java and Mauritius. In recent years, emigration has been very carefully regulated by the Government and attempts have been

made to secure for the emigrant full civic rights in the countries to which they have gone.

POPULATION OF PROVINCES.

| Province. | Variation 1921-1931 (+ or —) | | Percentage. |
|-------------------|------------------------------|----|-------------|
| | | | |
| Assam | .. | .. | .. +15.6 |
| Bengal | .. | .. | .. +7.32 |
| Bihar & Orissa | .. | .. | .. +10.6 |
| (Chota Nagpur) | .. | .. | .. +17.4 |
| Bombay Presidency | .. | .. | .. +14.4 |
| Central Provinces | .. | .. | .. +10.9 |
| Madras | .. | .. | .. +10.5 |
| Punjab | .. | .. | .. +13.9 |
| U. P. | .. | .. | .. +6.7 |
| Agra | .. | .. | .. +7.2 |
| Oudh | .. | .. | .. +5.1 |

CHAPTER XIV.

GROWTH OF TOWNS.

The time-worn saying that God made the village and man made the town offers a key to the study of the evolution of Indian cities. The early history of India discloses a band of nomadic tribes camping amidst the wilds of the North-West Frontier eking out a precarious livelihood on the spoils of hunting. Whenever the food available round about the camp was exhausted or the beasts proved too strong to be killed with their rude weapons, they struck out to new places to begin their life afresh. At this stage, no idea of a village could develop, economic life consisted in the satisfaction of present and immediate wants, and the thought of providing for the future did not occupy the minds of these nomads till they began to settle down along the fertile banks of the Indus. Here was laid the foundation of Indian villages and here set in a distinct change in their economic life as they began to cultivate the soil and to provide for the future. This rendered their existence easier, and development in the social organisation, in arts and sciences, was soon to follow. Therefore the earliest Indian villages were located on the routes from the North-West and along the banks of the mighty rivers of the Punjab. When the increase of population compelled them to move eastwards in search of new fields and fresh pastures, they followed the course of the Ganges and the Jamuna, till they came to Bengal founding new kingdoms and mighty states. The rivers of Northern India have therefore played a very important part in the establishment of villages and in the development of their economic life. Indian town planners preferred sites on river banks, sea coast or on land routes. "The orthodox treatises on Town planning, make it a rule to establish towns on the right bank of rivers. Consequently all Hindu towns in India are situated on the right bank of rivers. Hence any town in India whose location violates this rule, *e.g.*, Calcutta

may be presumed to have grown up or been established under non-Hindu influence.”* This explains to some extent the development of the cities of Allahabad, Agra, Cawnpore, Patna, Monghyr and Hooghly on the right bank of the Ganges. Most of these cities have grown at points where the river takes a wide bend, as the position is favourable to the landing and loading of goods in boats. These river towns owe their importance to the development of trade in goods in large quantities which break bulk. With the expansion of railway communication the commercial importance of these cities, *e.g.*, Farukhabad in U. P. has declined especially where there has been no industrial development to make up the deficiency, as the railway connects the country side directly with the ports. The cities of the U. P. are steadily declining in population, but the river ports of Eastern Bengal, *e.g.*, Chandpur and Barisal are flourishing as the waterway is even now the sole mode of transport. Confluence of two rivers is very favourable for the development of towns as a larger area is available for trade, *e.g.*, Allahabad. River fords also develop towns, *e.g.*, Attock on the Indus, Cuttack on the Mahanadi, Bezwada on the Kistna and Rajahmundry on the Godavari. Navigable rivers offer a very suitable site for the development of a sea-port near their mouth, but the importance of the port depends also on the prosperity of the hinterland and the availability of the facilities for safe harbourage. Surat on the Tapti and Broach, on the west coast, Calcutta, Chittagong and Rangoon are the prominent examples of this type of ports, but while Surat and Broach have declined, the other three ports have developed considerably.

“A city” as Prof. Geddes has remarked, “is not only a place in space, it is also a drama in time.” Geographical factors of situation alone do not explain the development of a town as the historical and economic background has also to be taken into account. Many towns have grown or decayed in India owing to the changes in the political history

* Cf. B. B. Dutt—Town Planning in Ancient India, page 28.

of the country. Murshidabad once the capital of Bengal has now been relegated to the status of a district headquarters. Fyzabad, a town of great historical importance, was shorn of its glory when Asafuddaula began to dislike it and transferred his capital to Lucknow. Delhi has regained its glory as the result of the change in the Capital of the Indian Empire. Ujjain and Gour, capitals of two important kingdoms of Mediaeval India, are insignificant places now in the modern map of India. Hence the original cause of the foundation of a town might be its suitable natural situation, or the historical factor, but its development is principally determined by economic causes, chief among which are the expansion of trade and commerce, and the development of organised industries. A city like Indore has developed to a considerable size owing to its being an industrial and commercial centre while Bhopal, the capital of the Native State of the same name, is declining owing to the lack of industries. Trade and commerce flourish where the means of communication are well developed and the country around it is in a position to supply the commodities of exchange. Formerly most of the important trade centres lay along the routes of the principal trunk roads and inland waterways, but owing to the expansion of railway communication, a marked change in the location of markets and trade centres has taken place, though with the development of motor traffic in very recent years the importance of the abandoned market centres is gradually coming back. That many of the Indian towns developed from the market centres is proved by the occurrence of such town names, as Cox's Bazar and Rampur *hat* in Bengal, Sahebganj in Bihar and Kasganj in U. P., etc. In many towns, important localities are called *Chowk* (central market), Sabjimundi, Sahaganj, etc., all of which illustrate clearly the market origin of the townships. In modern times when a large rural market centre is converted into a sub-divisional headquarters, it develops gradually into a small town. The expansion of a market town is conditioned by the geographical factor of its tributary area. If the means communication is well developed

and facilities for quick transport are available the market town can command a wide area, but if the railway facilities are equally distributed in the district, then the market towns lose their trade as the other neighbouring centres far from contributing to trade become their rivals. Peshawar enjoys the advantage of being the terminal station of the Afghan trade through the Khyber Pass, hence its population has increased by 16.7 per cent. between 1921-31. Calcutta commands a wide area for its supplies owing to the well-developed transportation facilities by land and by water. The Indo-Nepalese trade was carried on through various towns on the U. P. and Bihar frontier but with the opening of the Nepal State Railway the entire trade is generally tending to converge on Raxoul. With the electrification of the G. I. P. Railway, Bombay is now in a position to command a wider area for its men and supplies. Indian towns differ from many English towns in an important feature, *viz.*, in India, the town develops the trade, while in England the trade has developed towns. Small fishing villages in England have developed into prosperous ports and trade centres, but in India, though markets gradually develop into towns or though a town may be created by rulers for administrative or military purposes its prosperity depends on its being able to foster any trade or industry, *e.g.*, Benares owes its origin as a religious and intellectual centre but it has developed the well-known silk weaving industry, Moradabad is flourishing as a distributing centre, Amritsar and Sialkot owe their present importance to their industries while Murshidabad has lost its glory but has preserved its existence owing to the brass industry and silk weaving.

Considering the vast extent of the country, the urban population is very poor indeed and the process of urbanisation is very slow. Agricultural considerations require that a large percentage of the people must dwell in the villages and owing to the rigidity of the social system town-life is not at all congenial to a majority of the population. The urban population accounts for only 10 per cent. of persons living

in 2313 cities and towns of all types, and the two principal methods of increasing this urban population, by natural increase and migration from villages to towns, are working very slowly. The Bombay Presidency is the most urbanised province in India with about 18 per cent. of its population living in towns, but here too the increase is very slow, and the larger towns are increasing in size at the cost of the middle-sized ones owing to the contraction of the industries and trade in them. In the Madras Presidency, which ranks next to Bombay in urbanisation, the increase is in the urban population in the middle-sized towns on the east coast, as most of these towns are just emerging from the stage of overgrown villages to the status of real towns. The increase of urban population in Madras seems to be influenced to a considerable extent by agricultural conditions as in the Census of 1891 the rate of increase was greater than in the following Census, the period covered by which shows more favourable agricultural conditions and the development of small industries connected with agriculture.

Industrial factors have played a very important part in the growth of towns in modern times. We have already said that the growth of industries has succeeded in keeping up the importance of towns originated by different causes, while they are also responsible for the development of new towns which are the true types of industrial centres. Jamshedpur, Burnpore, Jhalda in Bihar and Orissa, Titagarh, Kankinara, Budge Budge, Kamarhati, Naihati, Serajgunje in Bengal, Cawnpore, Naini, Moradabad in the U. P., Amritsar and Sialkot in the Punjab, Dindigul in Madras, Kolar in Mysore, Ahmedabad and Sholapur in Bombay, Bilaspur and Jubbulpore in C. P., Bisra, Katni, Maihar in Central India have developed mainly due to the existence of one or more industries. These industrial towns are not fettered by the considerations of a local food supply as they can command a wide area for it. They spring up either at centres having proximity to the raw material, *e.g.*, Bisra, Sholapur and Dindigul or having proximity both to the raw material and supply of fuel, *e.g.*, Jamshedpur, Burnpore and Nagpur or

close to the port of export like the Mill towns close to Calcutta or at convenient railway centres like Cawnpore, Jubbulpore and Moradabad. Centres for the collection and partial manufacture of important raw materials have also developed towns, *e.g.*, Madaripore, Serajgunj and Narainganj in Bengal have excellent steamer facilities for the transport of raw jute which is despatched after being baled in these towns, Amraoti, Wardha and Nimar in C. P., Broach, Nasik, Ahmednagar, Dharwar and Belgaum are also important towns for the collection of raw cotton. The development of these industrial towns is not out of all proportion to regional considerations as their size is limited only by the extent of manufactures and the prosperity of the industry. The rapid expansion of Jamshedpur is principally due to the springing up of a large number of industries in the immediate neighbourhood which are connected with the Steel industry, while the development of Mirzapore as an industrial centre has been arrested owing to the gradual decline of the Lac industry and the manufacture of brass utensils. With the gradual concentration of a number of industries, Coimbatore is fast increasing in size and importance while the coal mining towns of Bengal and Bihar have received a setback due to the prolonged slump in the coal trade. Mining towns spring up close to the site of the mines, hence unless the deposits are concentrated within a small area, these towns cannot increase in size. The Bihar mining towns have not attained large dimensions owing to the occurrence of the deposit over a wide area and the mobile nature of the labourers employed there. The Kolar gold field owing to the compactness of the deposit and the facilities of electric supply from the Sivasamudram falls is in a position to support an ever increasing population.

Railway junctions account for the development of towns as they afford facilities for the growth of a collecting and distributing trade and in many cases they form the centres of manufactures or industries connected with the railways. Jamalpur and Khargpur, Gorakhpur and Moghalsarai, Jubbulpore, Kanchrapara, Waltair, Arkonam and Raichur are

important railway settlements. Delhi is essentially a nodal city being connected by railways with Karachi, Bombay and Calcutta. Cawnpore is an industrial as well as a distributing centre and it is served by three railway systems, the E. I. Railway (including the O. R. Railway), the G. I. P. Railway and B. & N. W. Railway. Bezwada has a still more favourable situation as a distributing centre, as it forms the junction of the S. M. Railway, Madras and Southern India Sections with the N. G. Railway and the M. S. M. Railway Northern Section and the Kistna River. The metre gauge section of the M. S. M. from Mormugao on the western sea-board affords a direct means of transport across Southern India to the eastern sea-coast at the port of Masaulipatam through Bezwada.

Owing to the intense heat in the plains of India it is often necessary for the well-to-do population to go to the bracing climate of the hills and the sea-coast. The Himalayan slopes averaging a height of 5000 to 8000 feet have furnished some of the important hill stations of Northern India, while in the Nilgiris we find some of the loveliest hill resorts of Southern India. The expansion of a hill station depends in addition to its altitude on the facilities of transport and the availability of level space for house-building while if the site chances to be selected also as the official summer residence of the Provincial Governors it acquires an additional importance. Murree and Dalhousie are the important hill stations on the way to Srinagar in Kashmir, famous as the garden of India. Simla is the most important hill station in India. It is the summer capital of India and it is accessible by railway as well as by road. Nainital and Mussoorie are the most important hill resorts of the U. P. but Nainital being its summer capital attracts a large number of visitors during the season. Darjeeling is the summer capital of Bengal and ranks next to Simla as the most important hill-station in North India. The Nilgiris have a number of hill-stations, *e.g.*, Kodaikanal, Coonoor and Ootacamund. The latter is called the finest hill-station in India. The east of India with its shallow water is suitable

for sea-bathing. Hence Puri, Waltair, Gopalpur and Madras are the principal seaside resorts in the east while Juhu near Bombay is most important on the west coast.

Last but not the least important cause of the development of towns is religion. Places considered sacred from the religious point of view attract large numbers of occasional visitors. Benares is the most important religious and educational centre in Northern India and next to it are Hardwar, Muttra, Brindavan and Puri. In Southern India Madura, Tanjore and Conjeeveram are the principal temple cities, while Nasik has considerable religious importance in Bombay.

Cantonments develop towns around them, the most important of these towns are found in the North West Frontier, while in the plains with the exception of a few places like Mhow, Kamptee, Amballa and Dinapur, the cantonments are located near about big towns and they add considerably to their importance. New Delhi and New Patna may be mentioned as the leading instances of town-planning in British India. In both these cases, the towns have been very carefully designed by the best architects with roads having a width from 70 to 150 feet, equipped with the latest scientific appliances calculated to improve the sanitation of the locality. These towns have not evolved but have been made to order. Jaipur perhaps is the only other town in India belonging to this type.

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